Land use Planning Strategies and their Impacts on Public Transportation Supply of Addis Ababa (Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Area)

By: Henock Berhane

Advisor: Alemayehu Ambo (Ph.D.)

A Thesis Submitted to Graduate Studies, Addis Ababa Science & Technology University, College of Civil Engineering & Architecture, in Partial Fulfillment for the Requirements of the Degree of Masters of Science in Road and Transportation Engineering

May, 2017
Addis Ababa

Land use Planning Strategies and their Impacts on Public Transportation Supply of Addis Ababa (Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda Area)

By

Henock Berhane Aberra

APPROVED BY BOARD OF EXAMINERS

_____	_____	_____
Chairman, Department Graduate Committee	Signature	Date
Dr. Alemayehu Ambo (Ph.D.)	_____	_____
Advisor	Signature	Date
Dr. Biruk Abate (PhD)	_____	_____
Internal Examiner	Signature	Date
Dr. Bikila Tiklu (PhD)	_____	_____
External Examiner	Signature	Date
Mr. Addisu B.	_____	_____
(Head,Department of Civil Engineering)	Signature	Date
Dr. Biruk Abate (PhD)	_____	_____
(Dean, Architecture and Civil Engineering)	Signature	Date

Statement of Certification

This is to certify that Henock Berhane has carried out his research work on the topic entitled "**Land use Planning Strategies and their Impacts on Public Transportation Supply of Addis Ababa (Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Area)**".

The work is original in nature and is suitable for submission for the award of Master Degree in Civil Engineering (Road and Transportation Engineering Stream).

Advisor: Dr. Alemayehu Ambo, (PhD) Signature ----------

Date: ----------

Statement of Declaration and Copy Right

I, the undersigned, declare that this study is my own original work that has not been presented and will not be presented by me to any other University for similar or any other degree award.

Declared by:

Name: Henock Berhane Signature ----------Date ----------

Confirmed by Advisor:

Name: Dr. Alemayehu Ambo (PhD) Signature ----------Date----------

Addis Ababa Science and Technology University

Date of Submission : Tuesday 2 May, 2017

Contents

List of Tables

List of Figures

Definition of Key Terms

Transport: a means of conveying people or goods from one place to another.

Urban transport: all types of means of transportation used in urban areas.

Urban public /Mass/ transport: Transportation by buses, trolley buses, and trams (not by cars) it includes mini-bus services in the current context.

Traffic Control: system of traffic engineering, employing prescribed traffic rules and regulations and devices such as signals, signs, and markings, to relieve vehicular congestion and air pollution, and to promote safety and pedestrian mobility, usually in heavily populated urban areas. In smaller towns, with lighter traffic, similar but simpler control devices and engineering techniques are used.

Road: public way, usually maintained by governmental authority, for the passage of vehicles, people, or animals. Roads in cities or towns are also called streets, lanes, avenues, or boulevards. Roads that connect populated areas to one another are often called motorways or highways.

Terminals: the places, where the customers get in touch with the city bus enterprise i.e. Anbessa. The way the terminals are managed, indirectly reflects, the importance the organization pays for customer information, customer service and quality of bus operations. The terminal is the ideal place, where all information regarding bus operations could be made available to passengers.

Anbessa City Bus: the yellow buses which are owned by the city government and operate mainly in the inner city of Addis Ababa.

Public Service Bus: the blue buses which are owned by the government and operate mainly in the inner city of Addis Ababa; also serves as transportation service for civil service servants of the city.

Alliance Bus: the blue buses which are owned by private shareholders and operate mainly in the inner city of Addis Ababa.

Sheger Bus: the blue buses which are owned by the city government and operate mainly in the inner city of Addis Ababa.

Shared Taxi: Mini buses (Blue taxis) which operate in the inner city of Addis Ababa.

Saloon Taxi: the yellow color meter taxis which operate in the inner city of Addis Ababa.

Light Rail Transit (LRT): Rail transport powered by electricity.

Acronyms

AACA : Addis Ababa City Administration

ACATA : Addis Ababa City Administration Transport Authority

AACG : Addis Ababa City Government

AACRA :Addis Ababa City Roads Authority

ACBSE: Anbessa City Bus Enterprise

AADT: Annual Average Daily Traffic

AASTU: Addis Ababa Science and Technology University

AU: African Union

BRT: Bus Rapid Transit

CS: Collector Street

CS: Collector Street

E.C.: Ethiopian Calendar

ECDPM : European Centre for Development Policy Management

ERA: Ethiopian Road Authority

G.O.R.S: Government of the Oromiya Regional State

Ha: Hectare

HDMR: High density mixed residence

HH: House hold

KG: Kindergarten

ICLEI: International Council of Local Environmental Initiatives

ISO: International Standardization Organization

LDP: Local Development Plan

LRT: Light Rail Transport

LS: Local Street

MSE: Micro and Small Enterprise

NCTCOG: North Central Texas Council of Governments

NDP: Neighborhood Development Plan

NGO : Non-Governmental Organizations

OECD: Organization for Economic Co-operation and Development

ORAAMP: Office for the Revision of Addis Ababa Master Plan

PAS: Principal Arterial Street

SAS: Sub-Arterial Street

SWOT: Strength, Weakness, Opportunity and Threat

UNDP : United Nations Development Program

UNECA : United Nations Economic Commission for Africa

UNEP: United Nations Environmental Program

ULGDP: Urban Local Government Development Program

Acknowledgements

The success of this thesis involved many people from many different professional backgrounds. I am indebted to all, near and far, who encouraged me in the process and gave me the driving force when I was really tired. Without their support, guidance and patience, this journey would have been climbing up a hill. However, there are some special people I would give more credits to:

1. *Dr. Alemayehu Ambo: He has helped me shape the thesis to this quality, though a lot is still remaining, with his frequent supervision and suggestion. He has given me insightful comments at every stage of this research. I am blessed to have my thesis supervised by such an optimist person.*
2. *Dr. Bikila Teklu,Dr. Mesay Daniel,Dr. Biruk Abate, Ato Tarekegne G/yesus, and Ato Raeed Ali: For helping me focus on Land use planning strategy and their impact on public transportation supply and shaping me in all aspects during the specialization period.*
3. *To all my families my father and mother and sisters next to the almighty.*

It goes without saying that my deepest gratitude extends to my classmates, all my friends in Addis Ababa and most of all my fiancée Ethiopian Road Authority, Addis Ababa Science and Technology University for their graciousness. It is always impossible to mention all, therefore, whoever has contributed to this thesis, one way or another, forgive me for not mentioning your name and accept my heartily praise.

Thank you all

Henock Berhane

Addis Ababa Science and Technology University

Addis Ababa, Ethiopia

Abstract

It has been long since mobility became a major issue in Addis Ababa following the enormous horizontal expansion of the city boundaries as a result of the rapid population and income growth. Although the rear studies conducted to understand and solve the problems related to urban public transportation supply in the city, most of them focus on the orthodox approach of improving the physical infrastructure of the transport sector to enhance the service provision by constructing highways, extending street and road networks and increasing the number of fleet. However, the problem proliferated and reached a critical level, already. This research approaches the problem from a different perspective; designing the city in a transit friendly manner by integrating land use and urban public transportation supply system. Therefore, the aim of this research was exploring the need and possibilities of strategically integrating land use and urban public transportation supply system to assure sustainable development of the city. The main research instrument used was Questionnaires, on site observation, field survey and also interviews conducted with authorities involved in formulation and implementation of land use and urban public transportation supply strategies in the city. Thus, interviews were held with seven authority's professionals in the Addis Ababa City Administration and the Addis Ababa transport Authority together with senior researchers in similar areas. In this qualitative research, observations in the research areas and desk studies supported the results of the interview. The initial hypothesis of the research is proved to be fully acceptable since the land use and urban public transportation supplying authorities do not recognize the impact of one on the other as validated by the increasing pressure on the urban public transportation supply system which resulted from the enormous horizontal expansion of the city. However, it was the main finding of the research that most of the activities in the city are governed by informality. Moreover, other factors including market force and politics are highly involved in determining the urban structure of Addis Ababa. Therefore, despite the need for integration of land use planning, urban public transportation supply system and environmental concerns for sustainable development, the focus on policy alone would be narrow and nugatory.

Key Words: Sustainable development, strategy integration, land use, public transport, (Mesalemiya-Aserasement Mazoriya- Lekuwanda), Addis Ababa

Chapter one: Introduction

1.1 Background

Addis Ababa, the capital and the largest city of Ethiopia, is expanding spatially to accommodate the increasing population resulting from natural growth and in-migration. As a result, residents living in the sprawled residential settlements at the fringes call for an affordable and efficient urban public transportation to accommodate travel to jobs, markets, health centers and other socio-economic activities. This development trend stretched the urban public transportation to its limits; hence, it became an earnest matter that solicits resolute action to sustain the development in the city where work requires substantial journey.

Affordable and efficient urban public transportation is central to development as it facilitates access to different amenities, in the absence of which quality of life suffers. Moreover, without physical access to resources and markets the process of growth stagnates and sustainability of poverty reduction programs becomes gloomy. Whereas, inappropriately designed transport policies and programs can aggravate the conditions of the poor and harm the ecosystem.

An orthodox solution focuses on improving the physical infrastructure of the transport sector to enhance the service provision by constructing highways, extending road-networks and increasing the fleet number. However, despite the effort, the problem proliferated and reached a critical level as demonstrated by congestion, deterioration of air quality, etc... Therefore, this research takes a different approach than the traditional to sustain the development by integrating land-use and urban public transportation supply strategies of the city, thus, decisions are complementary rather than contradictory. After all, they are crosscutting issues since transportation decisions affect land-use patterns and land-use decisions affect travel demand and modal choice. Therefore, Horizontal, vertical and inter- territorial integration of strategies and co-operation among authorities help sustain the development process.

The main research instrument, besides literature study, was Questionnaires, on site observation, interviews conducted with authorities involved in formulation and implementation of land use and transport policies in Addis Ababa. These interviews were held with seven authorities in the City Administration and the Federal Transport Authority together with senior researchers in similar areas. Moreover, in this qualitative research, observations in the research areas and desk studies supported the results of the interview.

This research revealed spatial segregation of different activities within the city's boundary with most of the fringe areas being earmarked for expansion mostly of residential settlements. The observation accounts for the planning, organizational structure and implementation of land use policies in the city and specific case study area. Besides, the trends of policy-making in the city shows a very poor level of integration and coordination that doesn't go beyond simple dialogues and information sharing among authorities resulting from poor institutional

arrangement and capacity. To make matters worth, the land-use/urban public transportation interaction in the city is made even complex as the result of the involvement of the neighboring Region in administering large part of the metropolitan area.

Another finding of the research shows that informal settlement and market forces predominantly govern the spatial structure of the city. This was demonstrated by the large informal residential cluster being observed at the periphery in search of cheap and spacious housing which resulted in an increasing travel demand that is beyond the capacity of the urban transport providers who are characterized by lawlessness, confusion and selfishness. In addition, informal business activities including land-use changes by alteration and extension of roadside units and growing street- vending and peddling together with poor pedestrian and drivers' attitude aggravated the transport problems of the city by encroaching the motorway and sidewalks.

Thus, it can be concluded that the integration of land-use and public transportation policies in Addis Ababa is very weak and the effect of the land-use plan on urban transport is not recognized by the authorities. Therefore, there is a need for horizontal integration between the different departments of the city-administration, vertical integration between the administration and the federal transport authority and inter-territorial integration between the city-administration and the Oromiya region. The integration helps the poverty reduction process in all aspects by promoting synergy, reducing duplication and inconsistency, and maximizing the effectiveness of policies and service delivery processes while stimulating economic development and social inclusion by creating different opportunities for the people, empowering the poor and enhancing safety/security. This can be considered as a major impetus to realize a sustainable development.

However, considering that informality takes the upper-hand in urban activities in Addis Ababa, despite the fact that there is a need for integrating policies for sustainable development, the focus on policy alone would be narrow and nugatory. Therefore, it is recommended to form inter- sectoral steering team, facilitate a more compact, infill and mixed development, form a comprehensive public transport policy, give emphasis for Non-Motorized transport infrastructure, make regulations to control transgression by private transport providers, encourage sequential land-development following incremental extension of transport services, and use articulated buses with segregated bus-lanes.

Sheger buses, Alliance buses, Light Rail Transit (LRT), midi buses (higer buses), mini-buses (shared taxis), Saloon taxis, Bajaj's and non-motorized transport with walking and animal drawn carts dominating at the periphery. (AACTA, 2014)

The demand for efficient and affordable public transportation is increasing with the sprawl of urban areas and increasing economic activities. The residential areas being developed at the edges of the

city voicing for demand of public transportation to accommodate travel to the city center where all activities; markets, offices, entertainment areas, etc, are concentrated. These and other unforeseen problems seemingly made private vehicle ownership the best means of transport available. As a result of this alarming increase in vehicle ownership, together with the poor road conditions in the city, Addis Ababa is now far from road safety taking 60% of the share in traffic accidents in the country. Moreover, this rapid increase of private vehicles, mostly not road worthy/very old/, has resulted in a very high air and noise pollution in the city (AACTA, 2014). However, a large proportion of the city's population is still crucially dependent on public transport services.

It is the physical location of different activities that influence the needs for travel and choice of transport modality. To date, it is witnessed that promoting using public transport alone has limited influence on the use of private vehicles (Wright, 2004). It is also made clear that the existing public transportation infrastructure is not adequate enough to satisfactorily meet the public transportation demand generated by the rapid growth of residential areas at the peripheries of our major cities. One part of the solution includes looking at ways of improving the urban public transportation supply to make it more flexible and responsive to user needs which includes expanding the road networks and/or increasing public transportation services. But the major part of the solution takes the land use policies in tackling the mobility problems and reducing the mobility needs of residents that refers to focusing more on developing residential areas in the city center and/or encouraging a more mixed land use development in the outskirts of the city.

This trend demonstrates the significant impacts of transportation on sustainable development and the complexity of the interaction between transportation and land use patterns. This complex interaction in patterns of sustainable development shows that it is not a single disciplinary issue but rather demands integration between transportation and land use policies. It is noted by (Stead D. , 2004)that as the number of actors involved in the policy process increases.

To sum up, the transportation system is an important part of a city and success in insuring mobility and can even be an indication of how well the city really is organized. Transportation is a common element used by all city mayors in the world while talking about being a 'world class city'. But as Addis Ababa keeps expanding horizontally as a result of increase in wealth and population, mobility in the city becomes a big issue. Here failure to provide well-functioning public transportation has caused growing social, economic as well as environmental problems in the city. These points emphasize the needs to recognize the effects of transportation in any land use planning in urban areas and integrate the policies. The research assesses the need for integration of land use and transportation policies in Kolfe Keranio and Addis Ketema Sub-cities that covers 63.48Km2 and 8.64 Km2 with their population size of 524,759 and 275,798 respectively. Kolfe Keranio population density is 7,879 and Addis Ketema with 34,467 persons/km^2 (Addis Ababa City Atlas first edition

2015, (Statistical report on the 2013 employment survey of Addis Ababa, May 2014) which makes them the sixth and the first population density (peoples/km^2) from the rest of Sub-cities respectively.

1.2 Statement of the Problem

Addis Ababa is the capital city and where most of the economic activities of the country are concentrated. As a result of limping public transport system and other reasons, the number of vehicles in the city is increasing, with the importance of taxis significantly getting higher by the day. This increasing vehicle numbers, together with the poor infrastructure has resulted in an increase in traffic accidents, congestion and poor mobility, and environmental degradation jeopardizing the economic advantages of the city. This is building negative images for the international community where Addis Ababa is home to embassies the Head Quarter of the African Union (AU) and the United Nations Economic Commission for Africa (UNECA). The population of Addis Ababa comprises 23% of the urban dwellers in the country and 11times the population of the next populated urban center Dire Dawa (Administration, Addis Ababa City Atlas,first edition, 2015)

All public transportation service components of the city incorporate, ACBSE, Public service buses (blue color), Sheger buses, Alliance Buses, Light Rail Transport (LRT) shared (minibus) taxis. However all these services providers, are proved to be incapable of meeting the increasing demand of the citizens due to the dynamic spatial de-concentration and rapid increase of the population of the city during the past years.

As the city expands horizontally to accommodate the ever increasing population as a result of natural population growth and in-migration from all corners of the country, the public transportation system has failed to meet the increasing demand generated from sprawling settlement at the peripheries. Spatial sprawl and increasing transport demand are concurrent trends that need coordination among actors and policy makers to solidly establish sustainable development which cannot be postponed but tackled urgently.

1.3 Justification of the Study

This research, as stated above, will focus on the impact of land use plan on public transportation system of Addis Ababa with a case study focused on two Sub-cities of Kolfe Keranio and Addis Ketema specifically on Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda road. The public transportation system is an essential part in creating sustainable city with a direct relation to social equity, environmental effectiveness and economic efficiency. Though there are studies conducted regarding land use patterns and transportation system of the city, most of them focused on the

traditional solution of improving the physical transportation infrastructure rather than looking at the need for integrating policies and strategies of these concurrent trends of development. Therefore, this research work will try to explore the need for integration of land use and transport policies and strategies in Addis Ababa especially in Kolfe Keranio and Addis Ketema Sub-cities.

The findings of this research will be expected to strengthen the needs for integration of land use plan and public transportation supply system in Addis Ababa. In addition, the findings could also contribute in providing solutions for similar problems in other urban cities of Ethiopia. Moreover, it is hoped that the research will try to contribute to knowledge building in sustainability of cities, in respect of integrating urban public transportation and land use planning.

1.4 Research objectives

1.4.1 General Objective

The general objective, of the research are: from a theoretical perspective, the concept of policy integration related to land use and Public transport supply system; analyze the need for integrating the land use and public transport supply policies to ensure sustainable development; and to identify and evaluate the opportunities and barriers for integrating the land use and public transport supply policies in Addis Ababa.

1.4.1 Specific Objectives

The following are the specific objectives of the thesis:

- To identify areas where those requires the involvement and evaluate the opportunities and barriers for integrating the land use and urban public transportation supplying stakeholders by taking Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Street as a demonstration.

- To analyze the need for integrating the land use and urban public transportation supply policies in order to remedial actions to be taken to ensure sustainable development in Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda area.

1.5 Description of the Research Area

Addis Ababa, is the capital, the major metropolitan area and the largest also a highland city situated in West Shewa, Oromiya, with geographical coordinates of 9°03´ North latitude and 38°42´ East longitude, approximately at the geographical center of the country, is characterized by high number of residential, commercial and industrial developments. Extensive physical growth is shown over the years growing from only 33km2 in 1920 to 224km2 in 1984 and since 1990 the area is estimated to be 530.14 square kilometers with a density of over 5600 people km2.

The city is sub-divided in to 10 sub-cities which in turn are divided to 116 kebeles where power is devolved to this smallest tier of administration. Having a concentration of settlements and irregular use of its structure plans (basically due to land use plan violations) the city is now subjected to various types of problems one of which is of course urban public transportation-related problem. Recent studies indicate that Ethiopia is among the African states with very minimal motorized vehicles above 708,416 of which about 63.2% of them are found in Addis Ababa (Federal Transport Authority, 2016).

Even though, construction of different new streets and roads as well as upgrading of the former ones have been undertaken intensively, there is still problem of congestion and high traffic accidents in the city. Though the problem is wide-spread almost throughout the city, it is very sever particularly in some sections of the city mainly during rush hours. In this regard the sample study area of Addis-Ketema-Kolfe-Aserasement Mazoriya-Lekuwanda is typical representative of the problems that reflects the extent of the challenge related to urban public transportation and mobility of the city.

In the city like Addis Ababa where the proportion of street is limited and the provision of urban public transportation is in an infant stage, the trend of mixed use development is encouraging but with cautious. The mixed use concept limits trips, encourage walking, living and getting service nearby. The concept of mixed use usually applies when residential function mixed with other compatible land use. However, mixity could occur with the absence of residence. The inherent idea embedded with the concept of mixed use is the creation of vibrant environment (vibrant economically and socially). To meet this important planning objectives the mix of residence to other land use is an important issue, and understanding the nature, level and form of mixity help to control its extent, so that it will not be a liability for any development. In this regard the new structure plan foresee mixity should exist in two forms- in land subdivision plan (from structure plan up to detail plan) and in a single building. To apply the above mentioned concept it is good to understand the nature of the structure plan. Out of the planned major structure plan elements some require strict interpretation and implementation of mixity. Mixed residence and commercial area major land use components where mixed-use concept is applicable. In addition to promote vibrant urban activities, through this concept it is expected to insure certain proportion of people reside in particular land use and mix of important lower level service.

The spatial land subdivision, detail planning and building permit process are always decision on a plot level or block level and this has to be validated with intent of the structure plan.
In rapidly growing urban areas, like Addis Ababa, access to land is being increasingly difficult by the conflicting demands of industry, housing, commerce, agriculture, land tenure structures and the need for open spaces.

In the past few years, while Addis Ababa has witnessed an amazing horizontal expansion and rapid growth in urban population, it has not been provided with an equal growth in urban public transportation provision time delay, demand shifting which has resulted in increasing private car ownership, high congestion, increasing pollution and large number of accidents and fatality rates; the pedestrian, elderly, disabled and children are being primary victims.

1.6 Research Structure

The research will be structured in chapters, each chapter will also comprise of sub-topics each of which will deal on specific thematic areas. Figure1. Below depicts the structure of the study.

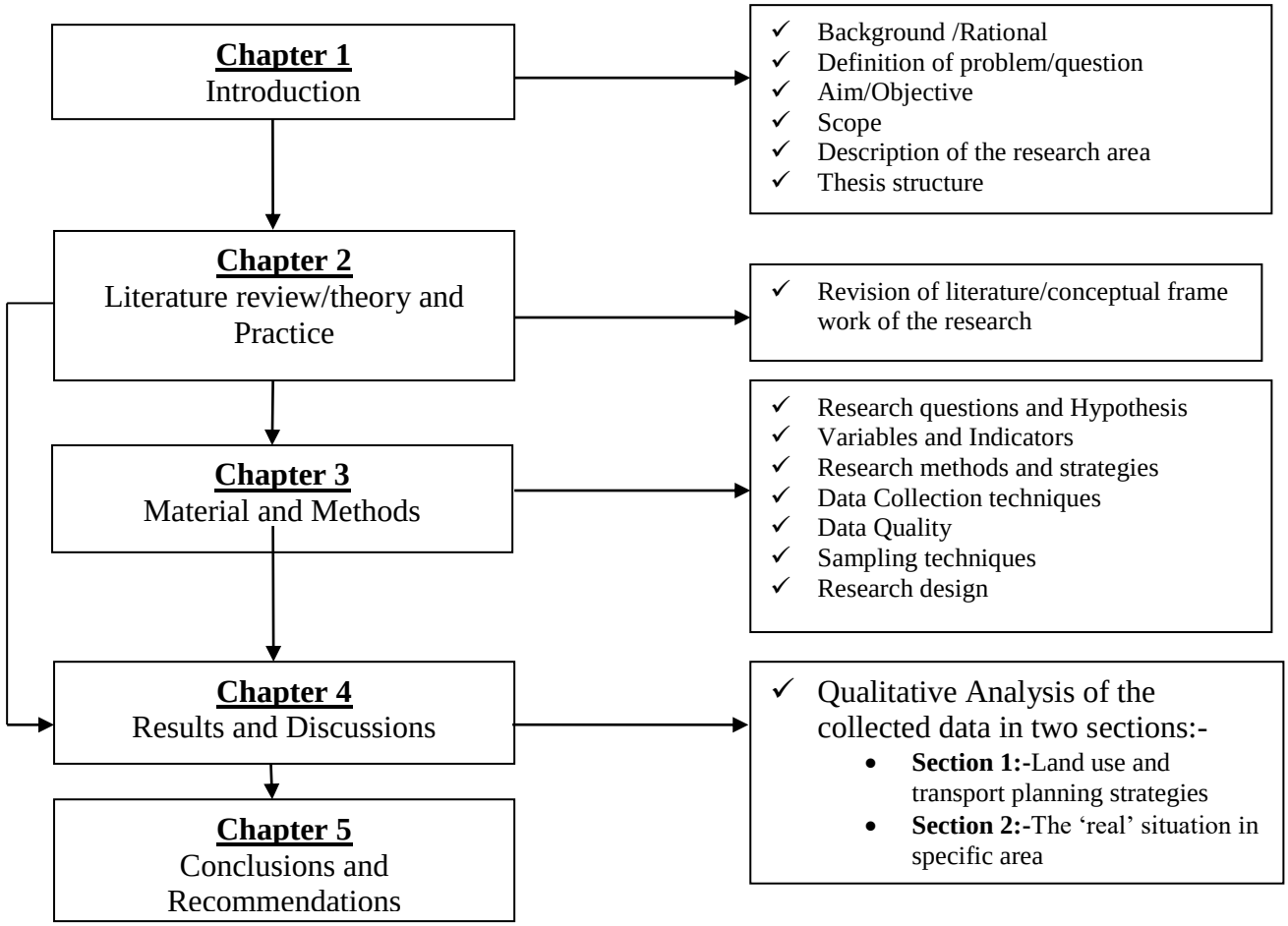

Figure 1Research Structure

Chapter Two: Literature review

2.1 Introduction

Integrated policy making is growing in importance as policy makers become aware of the limitations of single goal policy making. However, integrating policies to simultaneously address cross cutting issues can be neither a simply conceived nor easily implemented solution to the complicated urban problems. This is because, despite the consensus about the need for policy integration, information about the importance of policy integration in practice, the experiences of policy-makers with policy integration, and the mechanisms or tools for policy integration that could help to lead to more integrated policy are difficult to find (Stead D. , Institutional arrangements: experiences and lessons from Denmark, England and Germany. , 2003). But there are increasing calls for greater policy integration from a number of areas at times when decision making is facing increasing complexity as a result of various concurrent trends (Stead D. M., 2004). Moreover, policy formation and implementation are coming to involve a more variable mix of communities and actors, both within and outside the formal structures of government (Armstrong, Integrating policy, 1995a). This increasing diversity of voices speaking on the ever growing social and environmental problems in urban centers is also another reason for policy integration.

A **Strategy** is a unique plan made to achieve a market position and to reach the organizational goals and objectives, but **Policy** refers to a set of rules made by the organization for rational decision making. Many people have confusion regarding the two terms, but they are not alike. You should know that policies are subordinate to strategy. Here, in this article we made an attempt to point out the significant differences between Strategy and Policy. Have a look at it. (S., 2015)

Table 1: Comparison of Policy and Strategy

Basis for Comparison	Strategy	Policy
Meaning	Strategy is a comprehensive plan, made to accomplish the organizational goals.	Policy is the guiding principle that helps the organization to take logical decisions.
What is it?	Action plan	Action principle
Nature	Flexible	Fixed, but they allow exceptional situations
Orientation	Action	Decision
Formulation	Top Level Management and Middle Level Management	Top Level Management
Approach	Extroverted	Introverted

Source: http://keydifferences.com/difference-between-strategy-and-policy.html#ixzz4dtzltLNe

Key Differences between Strategy and Policy

According to (S., 2015) the major differences between strategy and policy

1. The strategy is the best plan opted from a number of plans, in order to achieve the organizational goals and objectives. The policy is a set of common rules and regulations, which forms as a base to take the day to day decisions.
2. The strategy is a plan of action while the policy is a principle of action.
3. Strategies can be modified as per the situation, so they are dynamic in nature. Conversely, Policies are uniform in nature. However, relaxations can be made for unexpected situations.
4. Strategies are concentrated toward actions, whereas Policies are decision oriented.
5. The top management always frames strategies, but sub-strategies are formulated at the middle level. In contrast to Policy, they are, in general, made by the top management.
6. Strategies deal with external environmental factors. On the other hand, Policies are made for internal environment of business.

2.1.1 Policy Integration: Theory and Concept

Though many are not using the term 'policy integration', there are a number of researches and articles produced in this area. According to (Peters B. G., 2005), policy integration is a level of coordination within the government that involves moving from coordinating not only the delivery of services but also the goals being pursued by public organizations, which makes it more politically difficult. This stage of coordination, not only requires the lower echelons of organizations to cooperate on the implementation stage, but also other levels of the organizations to ensure that their goals are compatible (Peters B. , 1998). But, (Stead D. , 2004) argue that policy integration is more far-reaching and more sophisticated than policy coordination which in turn is more sophisticated than cooperation.

Policy integration concerns the management of cross-cutting issues in policy-making that transcend the boundaries of established policy fields, and which do not correspond to the institutional responsibilities of individual departments (Stead D. M., 2004). Often, policy goals of different organizations might not be compatible and sometimes even contradict, so that substantial negotiations and perhaps imposition of authority from higher levels of governments may be required to make the organizations perform their tasks in a more integrated manner (Peters B. G., 2005).It has been identified that policy integration, policy coordination and cooperation at different hierarchy, as summarized in figure 2**,** is based on their level of interaction and complexity. In this regard it has been pointed out that:-

- Policy and strategy co-operation, at the lowest level, which simply implies dialogue and information policy coordination;

- Policy and strategy coherence and consistency, all quite similar, which imply cooperation plus transparency and some attempt to avoid policy conflicts (but do not necessarily imply the use of similar goals) ;
- Policy and strategy integration (joined-up policy), which includes dialogue and information (as in policy cooperation), transparency and avoidance of policy conflicts (as in policy co-ordination, policy coherence and policy consistency) but also includes joint working, attempts to create synergies between policies (win-win situations) and the use of the same goals to formulate policy (Stead D. M., 2004).

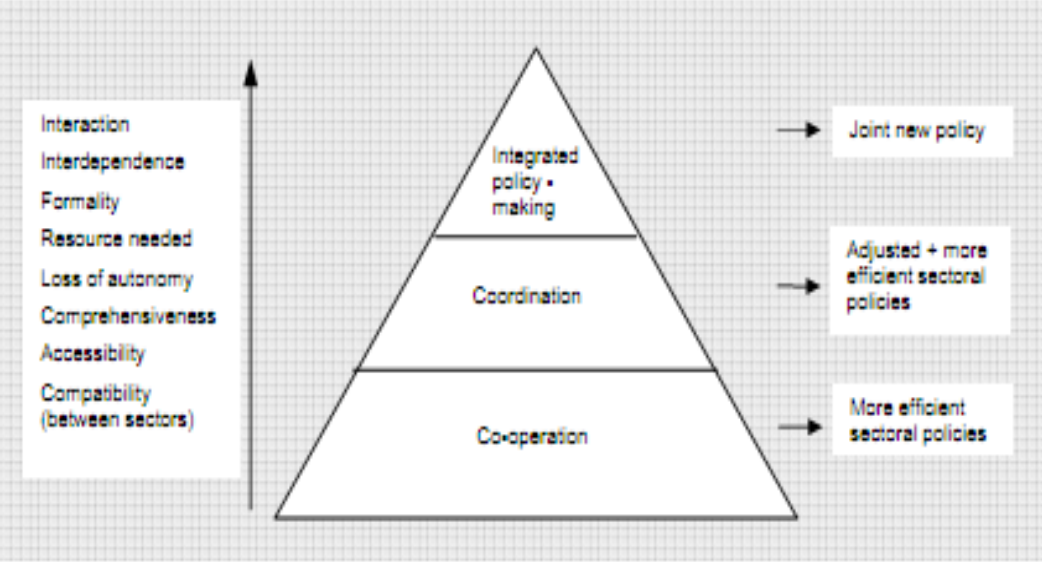

Figure 2.Integrated policy-making, policy coordination and cooperation

(Source: Stead et al., 2004)

Policy and strategy integration for the purpose of this paper is contemplated, as defined by (Stead D. , 2004) as a management tool of cross-cutting issues in policy making that transcend the boundaries of established policy fields, and which often do not correspond to the institutional responsibilities of individual departments. The notion of policy integration, according to (Ugland and Veggeland, 2006), can be defined and analyzed in terms of three criteria that refer to different aspects of policy making process:

I. **Consistency to the policy output:** determines if the various policy activities are coherent from the point of view of a specific objective.
II. **Interdependence to the causal linkages between the policy components:** determines if the various policy activities are inter-linked and causally linked with this specific objective.
III. **Structural connectedness to the inter-institutional relations:** determines how the various actors and institutions that are involved in the formulation and enforcement of these policies are coordinated in terms of authority, responsibility and information structures.

Synonym to policy integration usually used by the Organization of Economic Cooperation and Development (OECD) is policy coherence which encompasses policy interactions at several levels (Fukasaku, 2005). According to the working definition given by OECD, policy coherence is the effort to ensure that the objectives and results of a government's development policies are not undermined by other policies which will have impact on the development of the country. Hence, the process of forgoing greater policy coherence for development means matching different policy frameworks within an administration and/or between administrations (ECDPM and ICEI, 2006). Forster and Stokke (1999), as cited in ECDPM and ICEI scoping study (2006), defined a coherent policy as one whose objectives, within a given policy framework, are internally consistent and attuned to objectives pursued in other policy frameworks of the system.

Improved integration of policies plays crucial role when it comes to poverty reduction and sustainable use of natural resources by promoting synergy, reducing duplication and inconsistency, and maximizing the effectiveness of policies and service delivery processes. Its importance is even more decisive when it comes to issues that transcend organizational boundaries such as sustainable development that embrace economic development, social equity and environmental concerns. Therefore, for sustainable development of a nation, at least, policies' objectives should not conflict with intentions, motives, goals or values on which other policies are founded. A good coherence of policies implies improving the quality of the processes of collective action that characterize public and intergovernmental institutions.

An orthodox response to facilitate integration of policies among issues of growing importance, as sustainable development, has been creating new institutions. However, the process requires not only institutional restructuring but also government initiatives and political commitment to integrate economic, social and environmental goals within the authorities of existing organizations. Therefore, achieving greater policy coherence requires maintaining efforts to improve the integration of sectoral policies, ensure integration of policies across different tiers of government, and affirm consistency in the choices of stakeholders. In fact, success in integration of development policies requires precise understanding of economic, social and environmental implications of sustainable development among all stakeholders. Moreover, it demands commitment and leadership that comes from the top and develops throughout the organization, encouraging and facilitating stakeholders' participation at all levels of policy formulation, and adequate scientific input and knowledge management. However, since countries represent a diversity of different interests, standards and norms, achieving greater policy coherence in practice has proven to be unfeasible target to achieve but rather requires accepting a certain level of inconsistency.

In addition to what is said above, (Stead D. M., 2004) gave some tools for policy coherence based on OECD (1996) as shown in Table 1. Though they are derived from guidelines, procedure, indicators and best practice documents, these tools do not necessarily ensure success in integration of policies due to its opaque nature. However, since good governance and sound public management are important requirements for sustainable development policies, these tools may be used to facilitate the process of integration of policies and cooperation among authorities. Moreover, long-term budgeting and sound regulatory instruments, together with the right incentives, are critical elements for policy coherence and integration.

Generally, all policy frameworks should consistently create harmony among each other. In this respect political and leadership commitment is vital and shall consistently be monitored and evaluated. It is in line with this motive that (Stead D. M., 2004) noted the following points:

1. Political commitment is a necessary precondition for policy coherence, and a tool to enhance it. Establishing a strategic policy framework helps ensure that individual policies are consistent with national goals and priorities.
2. Decision makers need advice based on a clear definition and good analysis of the issues with explicit indications of possible inconsistencies.
3. The existence of a central overview and coordination capacity is essential to ensure horizontal consistency among policies.
4. Mechanisms to anticipate, detect and resolve policy conflicts early in the process help identify inconsistencies and reduce incoherence.
5. The decision-making process must be organized to achieve reconciliation between policy priorities and budgetary imperatives.
6. Implementation procedures and monitoring mechanisms must be designed to ensure that policies can be adjusted in the light of progress, new information and changing circumstances.
7. An administrative culture that promotes cross-sectoral cooperation and a systematic dialogue between different policy-communities contribute to the strengthening of policy coherence.

2.2 Land Use and Transport Planning

Fulfilling the resource requirements of a growing population, due to either migration or natural growth, ultimately requires some form of land-use change or urban expansion (urban sprawl) in order to provide for food, living space, recreation, infrastructure development and service provision. This in turn is easily manifested through the demand for an increased transportation supply. However there has always been a major debate amongst land use and transportation planners over which comes first, the development of land or the provision of transportation (J.D. Sampson1980)

Land use planning is a term that is often used interchangeably with that of town planning, urban planning, regional planning and urban design. In this report, land use planning is used to encompass the process of managing change in the built and natural environments at different spatial scales to secure sustainable outcomes for communities. It includes both spatial elements, such as the physical design and layout of neighborhoods, cities and regions, as well as strategic considerations that take into account of social, economic, cultural and environmental factors. The development of local and regional statutory plans is an important component of implementing land use planning as an expression of agreed public policy.

On the other hand transport plays a vital role in the development of the modern era as an integral part of the socio-economic and political structure of the country. In this regard urban transport, transport infrastructure, and traffic management should involve optimal integration as a means and ways of mobility to create maximum ease and comfort maintaining the socio-economic and physical integration of the city.

It is well understood that the modernization and urbanization processes accelerate, the importance of this sector in providing accessibility and hence mobility.

Transportation is an integral part of human life. Proper transport link enable efficient frequency of services, flow of passengers and commodities on (Rail, Roads, Air, Water) modes of transportation. Transportation theory (or the law) stresses strongly that whatever the mode will be, it should primarily consider the human aspect (i.e. safety, livability, economy, satisfaction…etc.) of transportation and mobility. (Jamet, 1998) This gives every individual the right to choose the right services that he/she desires.

Transportation and the different modes of mobility have evolved through time to accommodate the complex pattern of the world trade and globalization, based on the magnitude and efficiency of technological and operational improvement.

The urbanization process increases substantially the demand for urban services such as transportation, on whose efficiency and availability, the successful and continued existence of urban society depends. It has played a great role in the transformation of the society and facilities modernization at large. By so doing, it has changed the lifestyle of society from traditional to modern. The level of motorization and cost of its accommodation directly correlates with trends in per capita income. Furthermore, the demand for urban transportation is affected by the city size and population.

The urban transportation system should be modified and structured to contribute and operate within the principles and limitations of urban development planning by simultaneously considering and weighing several socioeconomic, spatial and other perspectives in the problem solving process. Hence, an efficient urban transport system can only be realized and sustainable through planning

which responds adequately to movements requirements and offers guidelines for better and efficient use of investment serving as invaluable input for spatial development policy.

2.3 Transport Infrastructure

As a general rule, the optimum urban public transportation system and the road network should involve the efficient integration of the means and ways of mobility to create ease and comfort so as to maintain local, regional and international interactions.

Accordingly, urban road classification depends on the character of services they provide. The role that road network plays in providing access to property and travel mobility is the major part of traffic management.

Efficient urban street network classification is derived from blood circulation patterns of living organism. The patterns are hierarchically divided into main streets, secondary streets and tertiary streets. Equally important intersections are in urban road network because of their effect on the movement and safety of vehicular traffic flow. In the planning process of road network system and the overall nature of mobility and accessibility, Planners should take into account not only vehicular flow but also pedestrian and all other forms of mobility environmental dimensions should also be taken into consideration.

Transportation infrastructure has negative economic, spatial, social, environmental impacts such as (air pollution, community displacement) etc. In this respect the generation of ancillary impacts, positive and negative, by the provision of transportation facilities and by their use is another argument put forward to support public supply of only selected infrastructure facilities.

Lastly, there is a principle of equity which essentially promotes that public mobility, provided by infrastructure facilities, is a merit that should be provided at a minimum level to all citizens, irrespective of their ability to pay for it. Hence the need the government's involvement in the provision of transportation infrastructure is an indispensable aspect of governance in an urban setting. (Akililu T. , 2013)

2.3.1 What is Transport Planning?

While there is no standard definition of transport planning, it is generally seen as a management and operation of systems and networks designed to facilitate the movement of people and goods from one place to another. It covers multi-modal, motorized and non-motorized movement by road, rail, water and air. For much of the 20th century, transport planning was heavily oriented towards facilitating automobile access with little consideration of the impacts on land use or other environmental factors. Increasingly, however, transport planners (in western societies) are being expected to adopt a multi-disciplinary approach, due to the rising importance of environmental

issues.

The effects of transport on land use can also be significant. (Litman, 2005) identifies both direct and indirect land-use impacts that can result from transport. Direct impacts result from the amount and location of land used for transport facilities (e.g. expanded roads, car parks, railways). Indirect impacts arise from transport decisions which affect land use accessibility. For example, an expanded motorway system that improves access to the urban fringe may encourage automobile dependant development and suburban sprawl. On the other hand, transport decisions that result in improvements to public transport can make urban areas more accessible and reduce car-dependency (ibid).

2.3.2 Planning Transportation Systems

Transportation networks are compromises between planners' ideals and complex reality. Transportation has always been dictated by such factors as economic, dynamics, social intensity, physical constraints, financial resources, and political desires. Thus, planning transportation systems should be a result of the contribution of team experts before final formulation of network. Although concerned professionals such as economists and sociologists may play an important role in forwarding the alternative assumptions in light of future developments, a final plan should include flexibility and adaptability to future changes. In this respect the following steps should normally be considered in the planning process of transportation systems:

- Define goals and objectives
- Study the site and region.
- Collect data and survey.

A. Physical aspects

- Land suitability
- Soil hazards and limitations
- Availability of quarries and building materials.
- Projected land use information and scheme

B. Social and economic aspects

- Existing and expected travel behavior of the population
- Trends of income
- Potential development traits
- Plan preparations
  - Pedestrians
  - Highways and streets
  - Town traffic center
  - Local and regional transportation centers; and
  - Setting in regional network

2.3.3 Public Transport Network

According to (Black, 1995) a network is a kind of graph, which is a geometric figure made up of points and lines. In practical applications, the points and lines are always interconnected. Each line has a point at each end, and several lines may meet at a single point. Transportation planners usually refer to a point as a node and to a line as a link. A network is defined as a graph in which there is some sort of flow. A transit network resembles the route map that a transit operator publishes. The links represent segments of transit routes. For a rail line, a link is a section of track; and for a bus route, it is a street on which buses run.

2.4 Urban Transport

Urban transportation is broadly categorized in to motorized or non-motorized modes. The choice of a particular mode of urban transport depends on such factors as accessibility and ease of operation. Non-motorized modes include Animal drawn Mode, Walking mode, and Bicycle. Whereas motorized modes includes Railways, Air plane, and Vehicular and Motor cycle.

"It is commonly accepted that cities are the engines of growth in most developing as well as developed countries. More importantly, urban transportation can be viewed as the oil that prevents this engine from seizing up."

Transportation is also diverse. It is multi-sector and, as such, it needs to be fully integrated with other municipal sectors. New transportation infrastructure must be part of a balanced urban development program including traffic demand management, public transport provision and supporting land use policies.

Economically, transportation is an essential element of city development that, in turn, is a major source of national economic growth. Simply stated, poor transportation inhibits growth. Furthermore, socially, transportation is the means of accessibility to jobs, health education and social services essential to the welfare of the city residents. Deteriorating transportation conditions affect all city residents; they impact particularly the poor through a decline in public transportation service levels, increased length of the journey to work and other essential services and the negative impacts on the environment, safety and security that the poor are least able to mitigate. (Akililu T. , 2013)

2.5 Overview of Land Use and Transportation Interaction

The connection between transportation system and land use is a fundamental concept in urban planning; because, transportation and land use are inexorably connected. Everything that happens to land use has transportation implications and every transportation action affects land use. Transportation network help shape land use by providing infrastructure to improve accessibility and mobility. Accessibility can be measured by the number of travel opportunities or destinations within a particular travel radius, measured in terms of either travel time or distance. On the other hand,

mobility is a measure of the ability to move efficiently between origins and these destinations. Thus, mobility is directly influenced by the layout of the transportation network and the level of service it offers. Land development generates travel, and travel generates the need for new facilities, which in turn increases accessibility and attracts further development. The question of whether transportation influences development or whether land use dictates transportation has been a matter of ongoing concern among transport professionals(Hanson, Susan).

Transportation's help is to move people and goods from one place to another, but transportation systems also affect community character, the natural and human environment, and economic development patterns. A transportation system can improve the economy, shape development patterns, and influence quality of life and the natural environment.

Land use and transportation are symbiotic: development density and location influence regional travel patterns, and, in turn, the degree of access provided by the transportation system can influence land use and development trends. Urban or community design can facilitate alternative travel modes. For example, a connected system of streets with higher residential densities and a mix of land uses can facilitate travel by foot, bicycle, and public transport, in addition to automobile. Conversely, dispersed land development patterns may facilitate vehicular travel and reduce the viability of other travel modes.

The key factor for understanding this impact of land use patterns on transportation is the concept of accessibility. Transportation infrastructures promote the spatial interaction between different activities which is measured by accessibility that reflects the attractiveness and ease of reaching these different activities. Studies show that the potential of interaction between any two places increase as the cost of movement between them decreases, either in terms of money or time (Inc. P. B., 1998). Similarly, land use pattern and urban form is influenced by the level of accessibility provided by transport system between different activities areas as stated by (Inc. P. B., 1998), accessibility links transportation and land use.

Figure 6 below illustrates the relationship between land use and transportation in terms of accessibility assuming a very simple relation without the influence of other factors. However, that is not the case in the real situation. The land use and transport interaction is affected by a number of factors including public policies such as land use planning and transport policies. This relationship can be conceptualized as an interaction of the supply of accessibility that considers the physical aspects of land use and transport, and demand for accessibility that considers the preferences of individuals and firms which is further affected by public policies.

Transportation ↔ **Accessibility** ↔ **Land use**

Figure 3.Accessibility links Transportation and Land Use

Source: Parsons Brinckerhoff Quade and Douglas Inc., 1998

2.6 Effects of Transport on Land Development

The United States' Department of Transportation (DOTs) influences land development through providing infrastructure and, to a lesser extent, through transportation-related regulations. These influences are seldom part of a project's goal and are usually not intentional. State transportation projects are normally planned to improve safety, decrease travel time by alleviating congestion, and achieve other mobility-related goals. Transportation's most significant impact on land development occurs when access is provided to land. Increased access to land raises its potential for development, and more development generates additional travel. Once access has been provided, land patterns begin to change over a period of time. The results of these changes are, for the most part, irreversible. Figure 7 below depicts indirect and cumulative effects analysis for project-induced land development as provided by the Wisconsin Department of Transportation (WisDOT1996) in the United States.

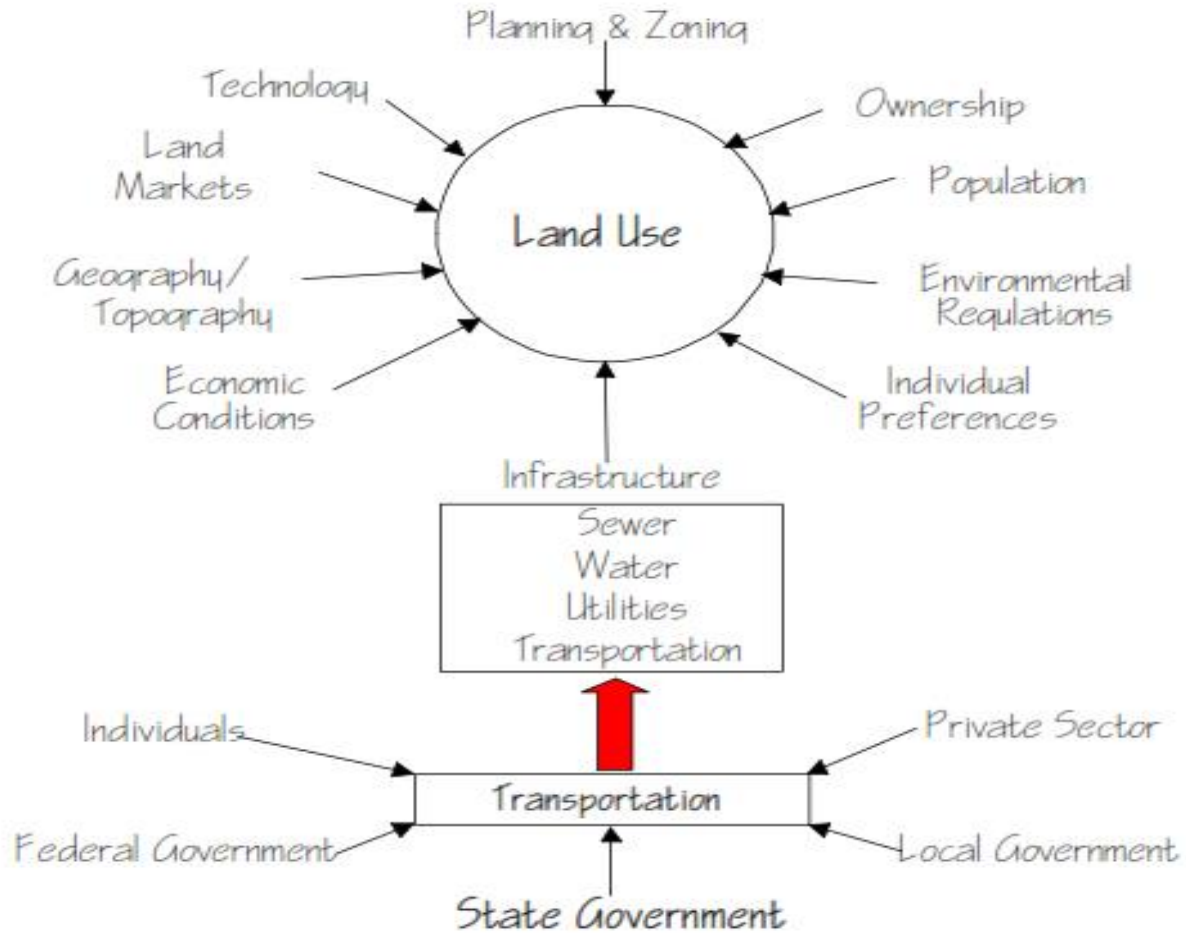

Figure 4.indirect and cumulative effects analysis for project-induced land development

Source: Wisconsin Department of Transportation (WisDOT1996)

The connections between land use and transportation have been well documented (Victoria Transport Policy Institute 2006). Land use is understood to affect transportation in a number of significant ways. Dispersed land use patterns are typically linked with high levels of automobile dependence. Conversely, concentrated land use is more commonly linked with lower levels of car use and higher levels of public transport patronage. The following were provided by the European Commission's (EC) TRANSLAND study, Paulley and Pedler, 2000.

- Higher residential densities and mixed development can lead to shorter car trips and lower levels of car use.
- Traditional neighborhoods can have shorter trips and lower levels of car use than car-oriented suburbs.
- Higher employment density can lead to greater public transport use.
- Developments close to public transportation can generate higher levels of public transportation use

The effects of transportation on land use can also be significant. Regarding this, (Litman, 2005) identified both direct and indirect land-use impacts that can result from transport. Direct impacts result from the amount and location of land used for transportation facilities (e.g. expanded roads, car parks, railways). Indirect impacts arise from transportation decisions which affect land use accessibility, (Litman, 2005). For example, an expanded motorway system that improves access to the urban fringe may encourage automobile dependant development and suburban sprawl, (Litman, 2005) on the other hand, transportation decisions that result in improvements to public transportation can make urban areas more accessible and reduce car-dependency (ibid). Table 2 depicts transportation's direct and indirect impacts.

Table 2.Examples of transport's direct and indirect impacts on land use.

Transport decision	Direct impacts	Indirect impacts
Increased parking supply	Increases paved area	Reduces density; encourages urban fringe development
Expanded urban roads	Increase paved area; degrade urban landscapes	Encourage urban fringe development
Public transport improvements	May require new facilities (eg, rail lines, stations)	Make urban areas more accessible

Source: Litman, 2005

The relationship between land use and transportation decisions can be complex and is influenced by a range of socio-economic factors (e.g, car ownership, housing demand and income). It may, therefore, be difficult to predict precisely the impacts of specific decisions.

The three important variables that must be quantified before any form of solution can be found while entertaining issues of urban transportation planning are:

- Desired level of usage of vehicles;
- Standard of desired environment; and
- Cost of improving the environment by changing existing physical patterns.

The above are considered as new town planning and principles.

The solution is largely to be found in the unification of the new separated functions of the road engineer and planner-architect, as well as 'administrative split- mindedness.' Figure 8 below illustrates supply and demand for accessibility as provided by (Quade and Douglas Inc., 1998).

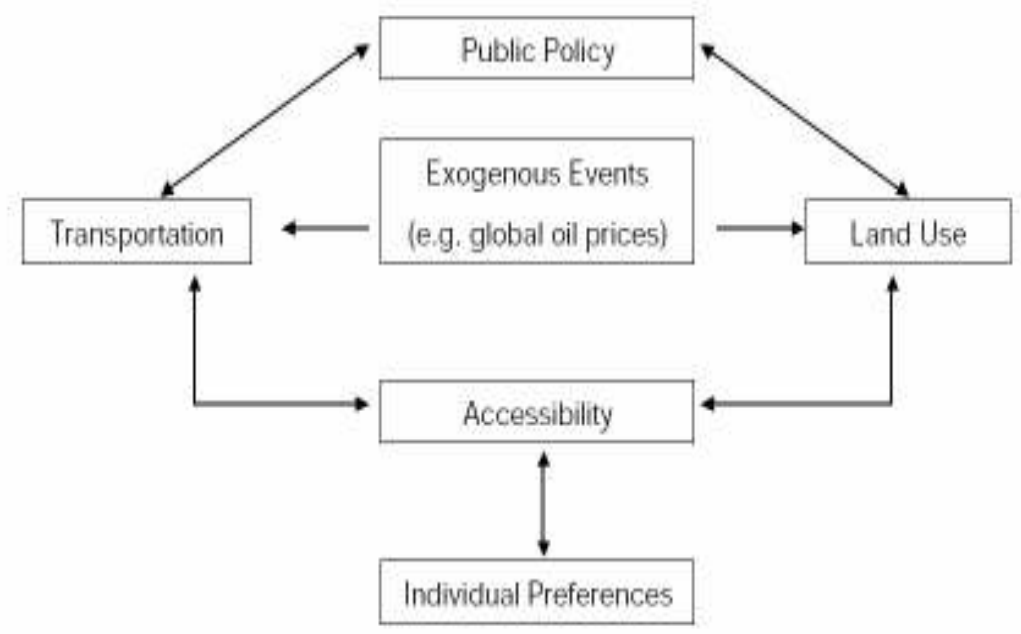

Figure 5.Supply and demand for accessibility

Source: Parsons Brinckerhoff Quade and Douglas Inc., 1998

(Meyer M. E., 1984) explained this interrelationship between land use and transportation using 'land use and transport interaction stipulated in Figure 8 above. Transportation system illustrated in the Figure 9, refers to modes of transportation, different technologies of transportation, the infrastructure, institutional set-up, and policies concerned with transportation system, while the activity system comprises of the socioeconomic and demographic characteristics of the area, including land-use policies and characteristics. In any of the cases, the development of land creates new travel demands which increase the need for transportation facilities whether in the form of new

infrastructure or more efficient operation of existing transportation facilities. Such improvements to the transportation facilities of an area will make land more accessible to existing activity centers, hence more attractive. What makes this land use and transport interaction more complex is that this increased accessibility and the resulting improvement of land values, in turn, influences the location decisions of individuals and firms, once again motivating new land development in the area and starting this cycle again until equilibrium is reached or until some other external factor intervene the process (Pujinda, 2006). In short, the activity system determines the demand for travel in an area, and transport system determines the supply to meet the current demand in that area. Figure 9 shows: land use and transportation interaction as provided by (Meyer M. a., 1984).

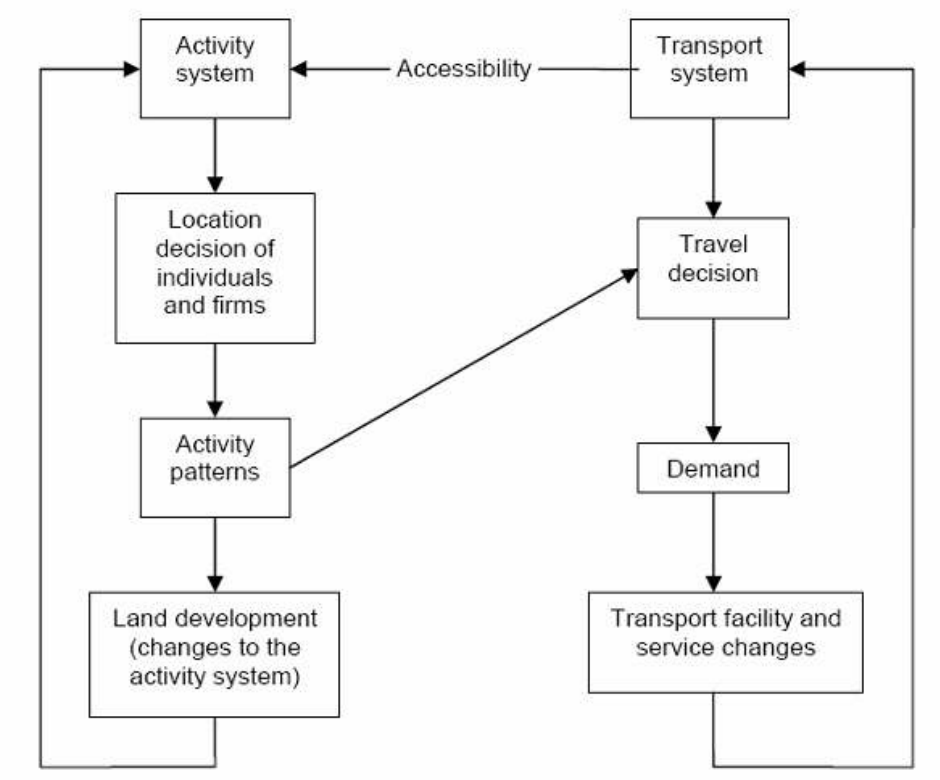

Figure 6.Land use and Transport interaction

(Source: Mayer and Miller, 1984)

(Wee B. i., 1997), as cited by (Wee B. u., 2000), illustrates even a more complex and comprehensive relationship between land use and transportation as shown Figure 10 below. The volume of passenger trips of an area and its modal split depends on the location of the different socio-economic activities, personal needs and desires of people that are related to socio-economic and cultural factors, and the transportation resistance that area dominantly guided by the time and cost of travel. More precisely, transportation resistances are decided by cost of travel, travel times, comfort, and reliability of transportation alternatives; all the three categories having considerable impact in all directions. If change occurs in any of the three categories of determinants, it will significantly affect the whole system which simply means that changes in land-use patterns will affect the transportation resistance between certain locations.

(Wee B. u., 2000) also suggests other indicators to measure the impact of land use on transportation as used in the empirical analysis of this research. These indicators include: the option value of an area, the consumer surplus, the cost of unsafely, peoples valuation of one thing over the other, financial aspects of land use transportation alternatives and robustness of the land use-transportation system. Figure 13 below illustrates the relationships between activity locations, needs and desires, transportation resistances and passenger transport as provided by **(1997)**.

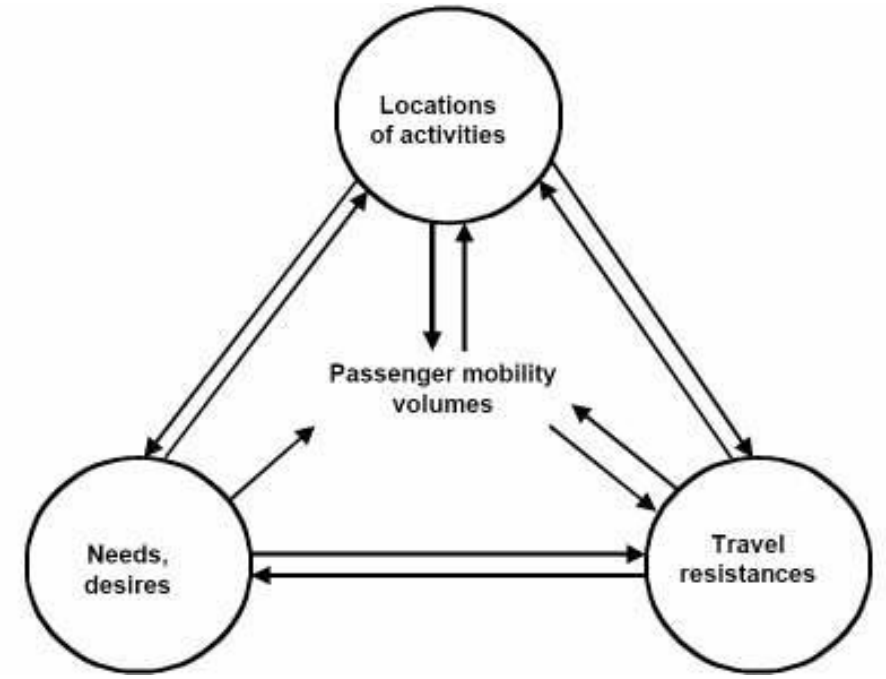

Figure 7.Relationships between activity locations, needs and desires, transport resistances and passenger transport

(Source: Wee, 1997)

Transportation and land use are critical elements of sustainable development given high emphasis in most development programs and policies since they are pervasively integrated to improving the urban environment and the lives of those living in it. This was magnified when the UN-HABITAT identified land-use planning, adequate housing, security of tenure, and reliable infrastructure and services together with good governance as decisive issues for making cities more sustainable for the poor.

Moreover, in the world of increasing concern for the ecosystem, the impact of the transportation system on the environment has been given a considerable attention. This is mainly because developing infrastructure for a motorized transportation system takes vast amount of land, intrudes into natural habitats and permanently alters the landscape of an area. But the concept of sustainable transportation promotes a balance of the economic as well as social benefits of transportation with equal consideration to the environment. A well-organized transportation system can enhance the

economic efficiency of urban centers and the result could be synergetic when integrated with land use strategies that result in reduced transport demand.

A transportation system is sustainable if it provides individuals and societies safe and affordable access to amenities and in a consistent way with human and ecosystem health, and also with equity within and between generations (Institute of Transport Engineers, 2004). To make this simple, a transportation system is said to be sustainable if it meets the mobility and accessibility needs of all residents by providing safe and environmentally friendly modes of transport. However, this is a very complex and difficult duty to achieve considering that the needs and demands of people belonging to different income groups are not only different but also often conflicting.

Most cities respond to this situation by introducing land use planning policies that encourage denser, more compact, sequential development patterns that support sustainable transportation. Studies (Knaap G. a., 2004)and (Newman, 2007), show that one problem associated with low density cities is sprawl-based vehicle dependence. When cities are built around automobiles, the land use pattern suggests that there is little alternative for transportation, hence they use ten times as much vehicles as other cities. On the other hand, cities with denser land use patterns support more transit and other non-motorized transportation options (ibid). Sustainable development emphasizes the land use and transportation relationship to improve mobility, enhance air quality, support economic growth, and ensure the financial stability of the transport system. Most of all, providing planning support for a variety of mobility options, such as automobiles, bicycling, walking, and mass transportation, helps local governments present a range of development opportunities to the private sector (NCTCOG, 2007).

So far, measures that promote the use of mass transportation in cities had only limited success in reducing vehicle use. It has also been said many times, (ITE, 2004) (Wright, 2004) that the most effective way to reduce the pollution and congestion caused by vehicle dependent society is to tackle the problem from the perspective of how communities are planned and redeveloped. It goes without saying that urban sprawl is closely related to transportation issues. The spatial pattern of sprawling cities is characterized by low population density and spatially segregated land uses. This trend of development is unfavorable to the provision of efficient public transportation and other sustainable transportation modes but rather urban sprawl cause's high level of private vehicle use. The impacts of urban sprawl on transport can, therefore, be mentioned as an increase of trip lengths, congestion on the radial roads giving access to city centers, increase in fuel consumption and air pollution. The guiding principles usually mentioned while talking about reducing pollution and congestion can be summarized under the following five categories:

- Reducing the travel demand and travel length by building residential areas at the right density close to mix of amenities and services;
- Ensuring that communities are well served with appropriate transportation services including cycles networks and walk ways,
- Facilitating and encouraging modal shift to non-motorized transportation options through site design,
- Improvement in the automobile technology, and
- Discouraging vehicle ownership by reducing the amount of vehicle parking spaces available.

As the result of these characteristics, compact and traditional development has drawn increasing attention from land use and environmental policy makers when compared to sprawl. The argument is that 'compact' or 'transit-oriented' neighborhoods can decrease automobile dependency, reduce air pollution, and also reduce the amount of land affected by impervious surfaces such as roads and parking lots (Carplus, Cars in Land use Planning., 2004).

This is one of the reasons that policy integration, at least in transport and land use, is gaining more global attention as a crucial element of sustainable development. So far, studies show that a more sustainable policy making for urban transport demands a more holistic approach in which decisions for land use and transport are made jointly. This is because land use strategies can influence transportation demand by shortening trip lengths (by providing near-by alternatives) and/or providing transportation mode alternatives that are efficient and cost effective.

Countries adopt variety of planning systems to address the problems of mobility in urban centers, but lack of integration between the land use and transportation planning can be considered as a general similarity between most countries. The only solution is to develop local strategies to integrate land use and transportation planning processes. Wegener and Fürst (1999) proposed the integration process of land-use and transport planning by "Vertical and Horizontal Coordination". Unlike the horizontal integration, vertical integration is already required by planning regulations in most countries and supported by a formal process (Pujinda, Planning of land use developments and transport systems in airport regions.Darmstadt,Technical University of Darmstadt., 2006)**.** Figure 11 below illustrates co-ordination and integration of land-use and transportation planning.

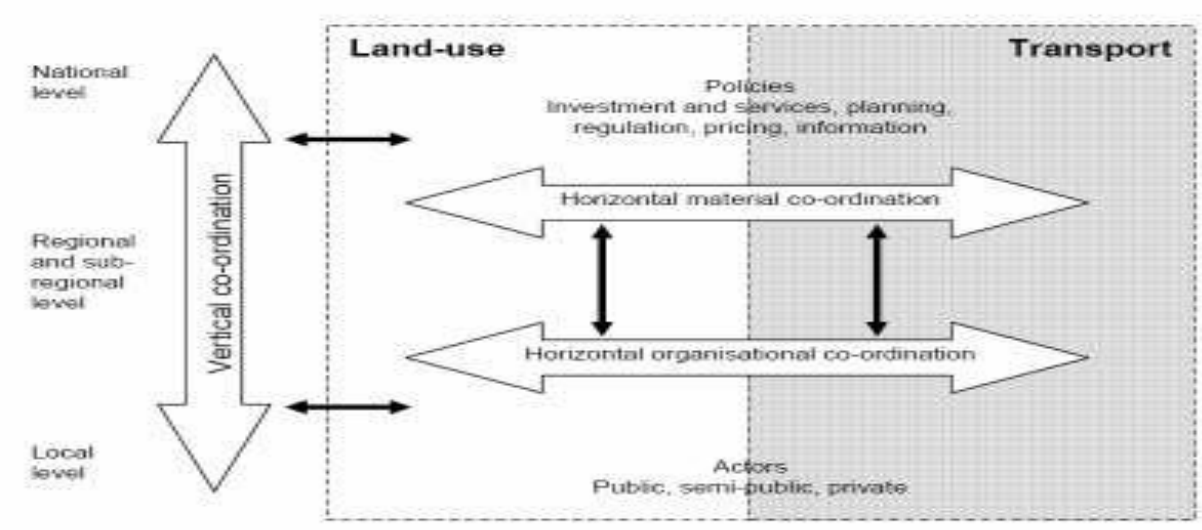

Figure 8.Co-ordination and integration of land-use and transport planning

2.7 The role of Integration

As the overview above indicates, land use and transportation decisions contribute significantly to shaping urban environments. Reflecting this, integration of land use and transport planning is increasingly being acknowledged as an important component of creating sustainable cities. Integration is seen as a means to an end rather than an end in itself.

The relationship between land use and transportation comprises a significant element of theories promoting more sustainable urban forms, variously described as compact cities, new urbanism and smart growth. These theories, which are becoming influential in informing land use policies both internationally and in New Zealand, are seen as ways of addressing problems of automobile dependence and associated environmental, social and economic impacts.

Common policies advocated by such theories to address current problems include:

- maximizing public transportation use and 'green' modes (e.g, walking, cycling) of transportation;
- managing private car use;
- minimizing urban sprawl; and
- Improving air quality through reducing fuel use and vehicle emissions.

Recent EC research reported by May (2005) highlights the need to ensure such policies are used in tandem. For example, urban intensification has been one of the main measures adopted to minimize urban sprawl. Advocates for intensification suggest there will be a reduction in the reliance on the private car and an increase in the use of public transport, walking and cycling. Other benefits are purported to include the development of a greater sense of community through closer social interaction (Jenks & 1999).

By itself, however, urban intensification is unlikely to lead to the achievement of better environmental and social outcomes. There may even be downsides such as increased localized congestion and negative impacts on amenity values. The EC (2004) concludes that land-use policies to increase urban density or mix land use, without accompanying transportation measures to restrict car use and provide alternatives to car use, will have only limited effect. Unless there are supporting transportation policies, urban intensification may simply bring more people and cars into already congested areas.

Highlighting the importance of integration, the EC research suggests that the most effective results can be achieved by using both 'push' and 'pull' measures, coupled with land use controls. 'Push' measures are designed to push the community away from excessive car use by introducing restrictions such as parking management. 'Pull' measures pull users towards sustainable modes of transportation by providing an efficient public transportation system and favorable conditions for walking and cycling. May (2005) argues such strategies can be expected to deliver a range of environmental, social and economic benefits including reductions in CO_2 emissions, improvements in air quality and enhanced health and safety.

Integrated policy making is growing in importance as policy makers become aware of the limitations of single goal policy making. However, integrating policies to simultaneously address cross-cutting issues can be neither a simply conceived nor easily implemented solution to the complicated urban problems. This is because, despite the consensus about the need for policy integration, information about the importance of policy integration in practice, the experiences of policy-makers with policy integration, and the mechanisms or tools for policy integration that could help lead to more integrated policy are difficult to find (Stead D. , Institutional arrangements:experiences and lessons from Denmark,England and Germany, 2003). But there are increasing calls for greater policy integration from a number of areas at times when decision making is facing increasing complexity as a result of various concurrent trends (Stead D. , 2004). Moreover, policy formation and implementation are coming to involve a more variable mix of communities and actors, both within and outside the formal structures of government (Armstrong, Integrating policy, 1995a).This increasing diversity of voices speaking on the ever growing social and environmental problems in urban centers is also another reason for policy integration.

2.8 Barriers to integration

While the importance of integrating land use and transportation planning is widely acknowledged, the delivery of integrated approaches remains problematic. A range of barriers to the effective integration continue to hinder successful implementation. As the European Conference of Ministers of Transport (2002) notes:

"Implementing integrated policy packages for sustainable urban travel has proven easier said than done Defining and effectively implementing sustainable policy strategies for urban travel involves bringing together the diverse and divergent interests of a great many actors in the urban transport system. These include: national, regional and local levels of government, politicians, public sector transportation and land use planning agencies, environmental authorities and advocacy groups, private sector transportation operators and other service providers, as well as real estate developers and the individual traveler. Co-ordination and co-operation among these stakeholders while essential to long-term implementation of sustainable strategies is often complex and resource-intensive".

Internationally, barriers to integration of land use and transportation planning have been the subject of several research initiatives. May et al. (2005) grouped common barriers into four main categories as stated below:

- Legal and institutional barriers, including lack of powers or divided responsibilities for implementing land use or other policy instruments;
- Financial barriers, including budget restrictions on total expenditure for implementing a strategy or limitations on the flexibility with which revenue instruments can be used to acquire land or invest in public transport infrastructure;
- Political and cultural barriers, including public or pressure group opposition to certain policy instruments such as road pricing or land use regulations; and
- Practical and technological barriers, including lack of tools, methods and/or skills needed to move from 'transportation engineering' solutions toward the design and delivery of integrated land use and transportation strategies of particular relevance to understanding legal and institutional barriers.

The EC-funded project TRANSPLUS (EC 2002). The TRANSPLUS project focused on identifying legal and institutional barriers to integration and examining potential solutions to these barriers. While the research centered on Europe, the findings are instructive in developing an understanding of factors that may be limiting integration in New Zealand.

Drawing on the TRANSPLUS study, several key barriers to land use and transportation integration can be identified as: Barriers created by organizational conflicts or complexity

Barriers to integration may occur due to conflicts or a lack of cooperation between organizations involved in planning. Conflicts or lack of cooperation may arise from differences in objectives or responsibilities, or disputes regarding cross-territory issues. TRANSPLUS identifies conflicts as including both:

- ‘horizontal’ conflicts between organizations at the same level. For example, the conflict may be between a city council and neighboring district authorities; and
- ‘vertical’ conflicts between organizations at different levels. For example, conflict may occur between a city authority and a regional authority or a regional authority and a national authority (EC 2002).

Other types of organizational conflicts identified by TRANSPLUS include those between public authorities and external bodies. For example, conflict may occur between a public authority and private transport operators, developers or the general public. Absent or inadequate opportunities for the wider public to be involved in decision-making generally exacerbate the potential for this type of conflict to occur.

Complex organizational arrangements may also give rise to barriers to integration. Where there is a complex system of agencies responsible for different aspects of land use and transport planning, TRANSPLUS concludes the most likely outcomes are a lack of clear direction and slow implementation and these are:

- **Barriers created by plan conflict or complexity**

  Barriers to integration can be created where land use and transportation plans provide conflicting objectives, policies and implementation mechanisms. TRANSPLUS concludes that the greater the number of different plans, the greater the potential for lack of coordination or conflict between plans. A proliferation of plans can also create the potential for barriers as a result of the complexity of planning arrangements.

- **Barriers created by professional conflicts**

  Direct conflicts between land use planning and transportation planning professionals or departments create another barrier to integration. This type of conflict may arise where there are separate departments or separate plans (e.g, land use plan, transport plan) pursuing separate objectives or directives. (Wegener, 1999).

2.9 Durban– South Africa experience

Ina developing country such as South Africa public transport is characterized by a number of peculiarities that are generally absent when compared to the public transport systems in first world countries. Urban Public transportation in developing countries is also generally characterized by a lack of adequate financial resources to fund operational subsidies not that it is not an issue in any other country, but it seems to be exacerbated in the developing world. On the other hand most of the captive users of public transport are generally not in a position to contribute significantly towards the fare box due to low levels of income and unemployment.

When the focus of national transport policy shifted from private to public transport various problems were experienced by public transport planners: Coordinating the public transport system of the Durban metropolitan area consists of various planning and modeling processes that are based on surveys of the public transport system and its users. These planning processes are very dependent on decision-makers' and planners' understanding of the current supply, utilization and trip patterns of various public transport modes as contained in the Current Public Transport Record (CPTR) of Durban. (Au camp, etal, 2001).

The various phases of the public transport management and planning life cycle used in Durban city are briefly explained below.

Understanding the current urban public transportation system: The public transport life cycle starts with the understanding of the current supply and utilization of services. The national land transport interim arrangements prep area current public transport record which is an inventory of the supply of public transport services and their capacity utilization .This was the main focus of PTMIS (Public Transport Management Information system) in Durban.

Following the understanding of the public transport system, it is necessary to understand user needs and preferences to ensure that the public transport system meets the needs of its users.

Develop modal and network strategies: Following the assessment of user needs and modeling of their choices, the impact of user choices on the demand for services by specific mode sand routes can be simulated by means of travel demand models.

Taxi permission and Rank allocation: Provincial and metropolitan authorities are in the process of legalizing mini bus taxi operators and converting area based permits in to route permissions according to the requirements of the national land transport transition act.

Development and management facilities: the development and management of terminal and modal transfer facilities are critical for an effective strategy to integrate different modes. The best location and demand for terminal and modal transfer facilities are determined from the travel demand on the preferred modal and network strategy.Figure15 below indicates the urban public transportation service delivery life cycle that needs to be managed and facilitated by metropolitan authorities or in future by proposed transport authorities according to the new act.

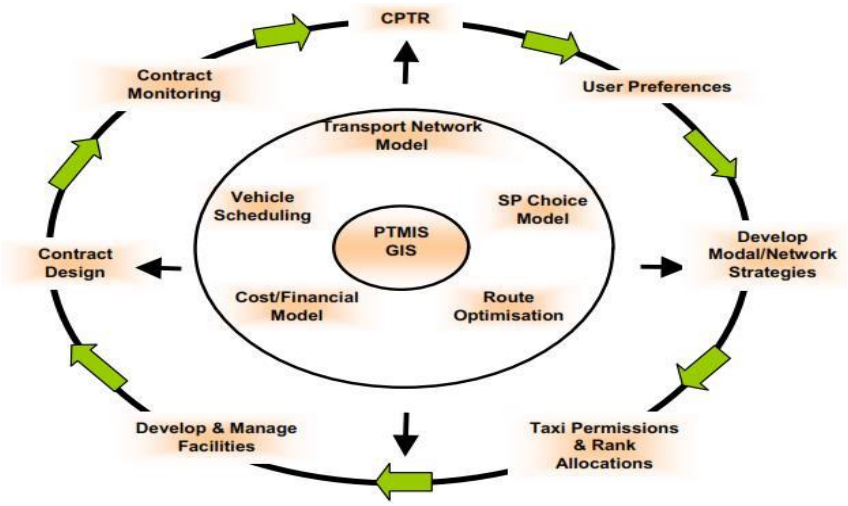

Figure 9.urban public transportation service delivery life cycle

2.10 Conceptual Framework

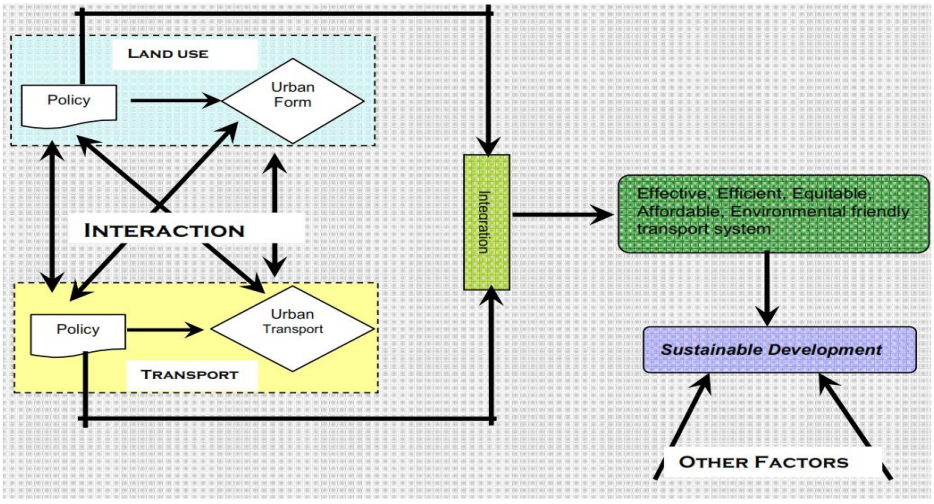

Figure 10. Interaction among policy, urban form and transport system

The conceptual frame work above illustrates that land use and transportation influence each other at the stage of policy formulation and/or implementation as were used in the research. These are stated as follows:

A. The land use policies affect the land use patterns of a city and at the same time will have impact on transportation policy; hence, the transportation system as a whole. Subsequently, the transportation system will further attract more development to the area that will affect further land use decisions.
B. Similarly, the transportation policies have impact on transportation service provision resulting in change in demand of an area and land use decision. This in turn affects the land use policies of a city to harmonize the situation with future development and control and direct development trends.
C. Spatial structure of cities that could be guided formally and informally will get the attention of transportation service providers hence will require some correction on land use and transportation policies.

This way all the four elements will affect one another therefore calls for a resolute action to sustain the development of the city. The idea is to emphasize that the role that the public transportation system plays in controlling the spatial structure of cities is as important as the role of the land use instruments to control the travel behaviors of people. Therefore, integrating land use and transportation policies will bring the economic, social and environmental dimensions of land use and transportation to a profile that ensures sustainable development of urban centers together with other development strategies of cities.

2.11 Traffic congestion

Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer travels time, and increased vehicular queuing. The most common example is the physical use of roads by vehicles. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up. (Manual, 2009).

2.11.1 Causes of congestion

Congestion may be related to one of two sets of conditions - either, to inefficiencies within the traffic flow system or to the demand placed on the existing road or mixture of both. In developed countries, the causes are related to both cases; too many taxis on the existing road, high number of cars, children cannot walk to schools and these are all problems related to demand placed on the existing road. While the road system and absence of staged hour is cause related to flow system.

In countries like Ethiopia, the cause of congestion is related to:

Social and economic factors such as inadequate planning, unplanned land use such as concentration of offices within cities and inadequate public transport;

Road factors: including geometric alignment, pavement properties and control mechanisms of roads;

Vehicle factors: The length, width and height of vehicles;

Human factors: drivers, pedestrians, and cyclists ability; and

Accident factors: lack of immediate settlement by the parties concerned or inability to remove disable vehicles immediately in the case of more serious accidents that traffic congestion caused by many reasons, such as imbalance between the traffic volume and road capacity, inflexible work schedules, inadequate public transport, and poor urban land-use plan are the main reasons. Most journeys along the road are from various peripheral areas of the city to the core areas mainly for daily work and market purposes. On average interval, peoples are traveling between 6 -10 km per day, and most of which are making in 1:30 â 9:30 a.m. and5:30- 7:30 p.m. Traffic is highly

congested with in this two peak periods. In Addis Ababa, the population of high occupancy vehicles is very low. Surprisingly, evidence shows that the volume of vehicles population will be doubled after 6.3 years, most of which are small personal and private vehicles. Pertaining to the road network coverage of the city, data indicates that the total road length of the city is increasing from time to time. However, it is sluggish in contrasting with the annual vehicles population growth (1.6 %). Vehicles are consuming more fuel in a congested traffic environment than in a free flow condition though its extent is varying from vehicle to vehicle due to their fuel- efficiency and daily total distance traveling. Moreover, regarding travel time or delay, it is 3 and 5 minutes per vehicle and passenger per trip with in a peak hours respectively. Specifically, the situation is becoming severe at Mesalemiya-Kolfe-Aserasement-Mazoria Lekuwanda intersection due to its narrowness. Lastly, congestion problem can be mitigated through different strategies, such as, apply flextime working time, improve capacity of roads, improving urban Public transportation, and experiencing adequate parking arrangements, implement transit oriented development, and improved access management (Impact of Traffic Congestion in Addis Ababa, Yared Heregwoin,2015)

2.11.2 Measurements of congestion

We can measure congestion using different mechanisms. The most familiar are:-

- Roadway Level of Service (LOS);
- Average traffic speed; and
- Average congestion delay compared with free-flowing traffic.

Level of service (LOS)

It is a qualitative measure that describes operational conditions within a traffic stream. There are six level of services A through F which define the full range of driving conditions from best to worst condition in that order.

These levels of services qualitatively measure the effects of factors such as travel time, speeds, freedom to maneuver, cost etc. With each level of service, a service flow rate, the maximum volume that can pass over a given section of roads while operating conditions are maintained at the specified LOS.

Average traffic speed

Comparing average traffic speed at free flow state with congested state helps to measure the impact of congestion.

Average congestion Delay compared with free-flowing traffic

This helps to compare the delay time occurring due to congestion with that of a free flow or normal condition of the road. This mechanism is used to assess the negative impact of congestion on the selected route.

2.11.3 Impacts of congestion

The impact of congestion is quite obvious; it affects the social life, economy, environment and health of mankind and animals. Some of the negative impact on human community will be discussed as below.

2.11.4 Social impact of congestion

Congestion cause delays which may result in late arrival for employment, meeting, appointment, education resulting in interruption of normal social and economic process. It affects the interaction of people in different ways. For instance, a person spending long time on a road might not have sufficient time to spend with his/her family, or cannot visit families. Non recurrent congestion also creates inability to forecast the travel time and arrival time accurately, therefore causing undesirable (late) arrival time.

Blocked traffic also interferes with the passage of emergency vehicles traveling to their destinations where they are urgently needed. The death might happen in a patient travelling by emergency vehicles or other mode of transportation due to the delay caused by the congestion.

Road rage is also caused by congestion, which is aggressive and angry behavior of a driver such as rude gestures, verbal insults, deliberately driving in unsafe or threatening manner. Road rage can lead to altercation, assaults, and collisions which result in injuries and even deaths. It can be thought of as an extreme case of aggressive driving.

2.11.5 Economic impact of congestion

Congestion affects the economy of a country in different ways. Some of these are:

- Higher chance of collision due to tight spacing and constant stopping and going;
- Wasting time of motorists and passengers i.e. Non-productive activity for most people; congestion reduces regional economic health.
- Negative impact on the delivery of goods and services.
- Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements; and
- Strained and congested roads eat up fuel; increased fuel use may also in theory cause a rise in fuel costs.

2.11.6 Impact on the design life of Pavement

The life time of pavement is related to the burden it is exposed for. The more the road is exposed to traffic during congestion the less the life time of the road will be. Sometimes vehicles form queues on bridges as dead load, which affect the design life time of the bridge. The pavements which are

usually exposed to traffic congestion are subjected to stripping and fatigue cracking. Due to this, such pavements need frequent rehabilitation programs, which indirectly affect the economy of a country.

2.12 Environmental & Health impact

Research done by Levy, Buonocore, and Stackelberg (2012); indicates that vehicle emissions contain pollutants that contribute to outdoor air pollution. One in particular, fine particulate matter (referred to as PM2.5) is strongly influenced by motor vehicle emissions. Studies that evaluate the sources of PM2.5 in our environment find that vehicles contribute up to one-third of observed PM2.5 in urban areas. PM2.5 has been associated with premature deaths in many studies, and health impact assessments have shown PM2.5-related damages on the order of hundreds of billions of dollars per year. Recently, an expert committee convened by the Health Effects Institute in Boston, Massachusetts, summarized the available evidence on exposure to traffic-generated air pollution and negative health effects. They find strong evidence for a causative role for traffic related air pollution and premature death, particularly from heart attacks and strokes. PM2.5 is emitted directly, and it is also produced by secondary formation, as sulfur dioxide (SO_2) and nitrogen oxide (NOx) emissions contribute to the formation of sulfate and nitrate particles. Exposure to PM2.5 also causes other health effects such as asthma attacks, and other respiratory illnesses (Agrawal D. J., 2013).

Congestion also makes people to go out early in the morning without having adequate sleep which indirectly affects the performance of people in their job and spending frustrated. Stressed and frustrated motorists are encouraged to road rage.

2.13 History of Addis Ababa and its Expansion

Addis Ababa was established in 1886 by Emperor Menelik II and his wife Empress Taitu. It is situated at the foot hills of the Entoto Mountains and standing at 2,400 meters above sea level which makes it the third highest capital in the world. Wide spread building programs were taken in the late 1980s and the city became the political, administrative, and religious hub of the country (Garretson, 2000). There has been a rapid growth of population in the city in the last four decades mainly because of natural urban population increase and in-migration from the rural areas (Melese, 2005). Table 8 shows the population, including growth, of the Addis Ababa city between 1910 to 2014 G.C.

Table 3: Population growth of Addis Ababa City

Year	Population	Annual average growth rate(%)
1910	65,000	-
1935	100,000	1.74
1952	317,925	7.04
1961	443,728	3.77
1970	750,530	6.01
1976	1,099,851	6.58
1984	1,423,111	3.27
1994	2,112,737	5.06
2000	2,495,000	1.68
2004	2,805,000	2.97
2015	3,194,999	1.19

(Source: CSA, 2014)

This rapid growth of population has put tremendous pressure on the urban spaces in the city. Studies show that large proportion of this growth appears to be in slums and squatter settlements in the city **(UN-HABITAT, 2007)**. In response to this acute demand, efforts are being made by the city government to incorporate the peripheral areas of the city, which is resulting in hastening the sprawl of the built-up area of the city and a rapid physical expansion.Table9 shows the physical growth of the city built-up area during1986-2000 as provided by **(Melese, 2005)** and Figure 13 shows the physical expansion of the city in the last thirty five years.

Table 4: Physical growth of Addis Ababa Citybuilt-uparea1986-2000

Period	Area covered (hectares)	Total built-up area (hectares)	Annual growth rate (%)
1886-1936	1,863.13	1,863.13	-
1937-1975	4,186.87	6,050.0	3.1
1976-1985	4,788.0	10,838.0	6.0
1986-1995	2,925.3	13,763.3	2.4
1996-2000	909.4	14,672.7	1.6

Source: Melese, 2005

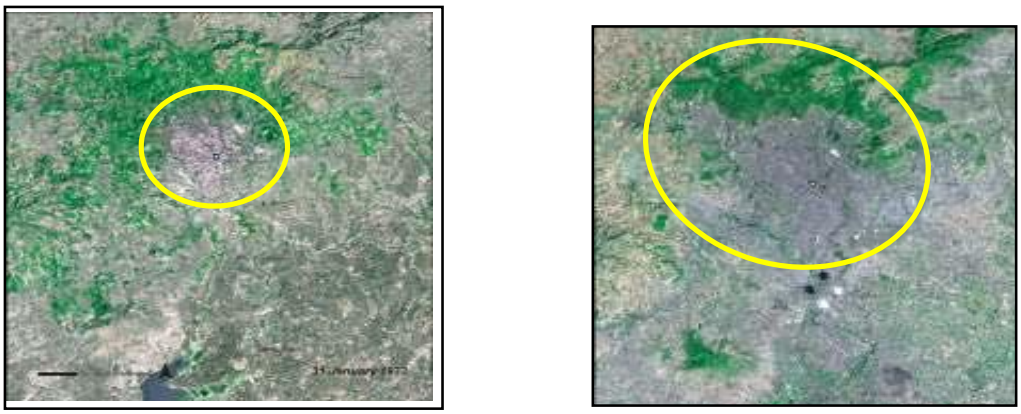

Figure 11.Expansion of the city during the last thirty five years

According to (Melese, 2005), from 1886 to 1936, the development trend of the city was characterized by fragmented settlements. Following the Italian occupation in 1937 up to 1975, the process of physical development of Addis Ababa was focused more on expanding the built-up area of the city by compact development and consolidation of the former fragmented settlements. The period from 1976 to 1985 was when the city's built-up area showed a tremendous increase of 4,788 hectares that shoot up the cumulative total to 10,838 hectares. Simultaneously, horizontal expansion took place in all the peripheral areas of the city, where both legal and illegal settlements were established.

Out of the total 94,135 housing units built in the city between 1984 and 1994, 15.7% (14,794 housing units) were built by squatters (Melese, 2005). This way, the physical expansion of the city went increasing and the cumulative reached 14,672.7 hectares in the period from 1996 to 2000. This expansion of the city was characterized by the development of scattered and fragmented settlements in the peripheral areas of the city, with both legal residents and informal settlements. In 2000, Addis Ababa had an estimated total of 60,000 housing units with informal settlements. This figure accounted for 20% of the total housing stock of the city and the total area occupied by squatter settlements was estimated at 13.6% of the total built-up area.

This trend of development also demonstrates a very compact and dense development along major corridors at the inner city, while scattered developments, excessive use and empty spaces dominate the peripheries as shown in Figure 14, showing the percentage size of the Addis Ababa population in respect of the Sub cities.

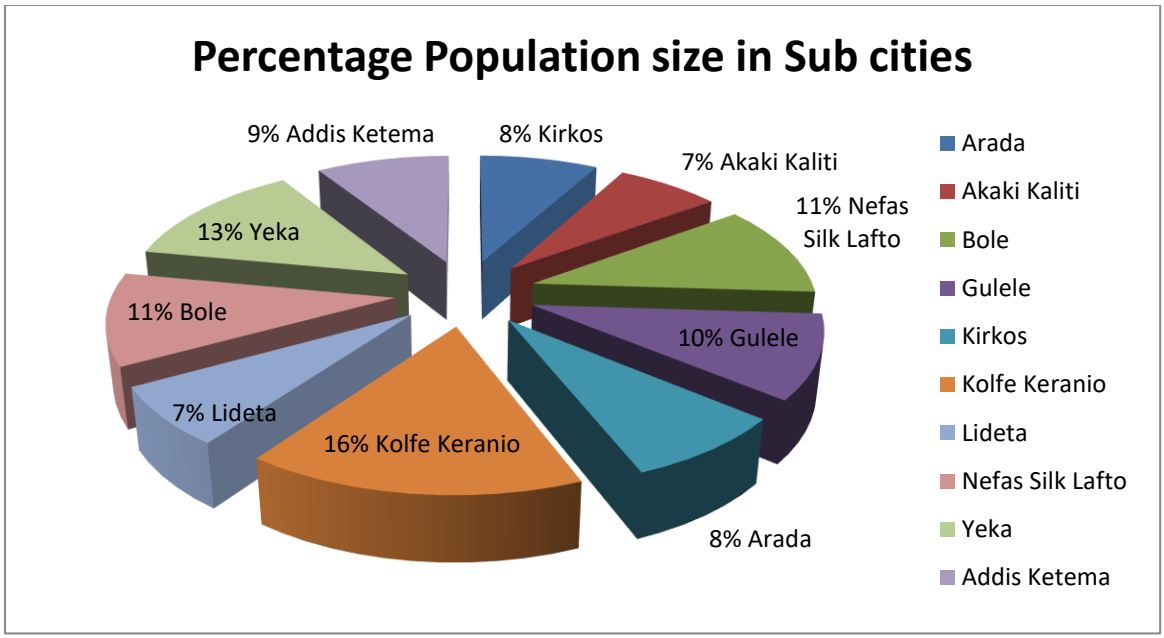

Figure 12.Graph Showing Population density in Sub cities

Source: Addis Ababa City Atlas, 2015

Addis Ababa is a high land city situated in the chartered city of Oromiya, with geographical coordinates of 9° 03´ North latitude and 38°42´ East longitude, approximately at the center of the country. Extensive physical growth is shown over the years from only 33 km^2 in 1920 to 224 km^2 in 1984 with average annual increase of 3.0 percent. Since 1990, the area is estimated to be 530.14 km^2 in 2002 and grew to 540 km^2 in 2011 with a density of over 5,600 persons per km^2. The city's radius has widened in four directions, especially to the east and south. Expansion of the city has direct relationship with travel facility and trip making characteristics (World Bank, 2002b). The city's growth has accelerated dramatically since a major urban migration into the city in the mid-70s, driven mainly by unemployment, poverty and declining agricultural productivity in rural areas, and relatively improved income and employment opportunities in the urban areas. The city is not only the political center but the economic and social nerve-center of the country (Ethiopian Triple Helix Association, 2006).

As provided by the Addis Ababa City Atlas, first edition 2015, Addis Ababa is sub-divided into 10 sub-cities which in turn are divided into 116 Woredas where power is devolved to this smallest tier of administration. The Central Statistical Agency (CSA) figures of 2005 show that, the current population of Addis Ababa has reached 4.5 million with 52% women and 48% men which makes it almost 11 times that of Dire Dawa, the second largest city in Ethiopia. The figure also shows that all the inhabitants of the city are considered to be urban dwellers that cover 23% of the countries urban population.

Accordingly, the crude population density (the ratio of total population to the total area of the city) was 6150.26 per km^2 in 2014. With regard to sex ratio (number of males to female population) it is 0.90 showing low sex ratio compared to the Federal sex ratio of 1.02.

In rapidly growing urban areas, like Addis Ababa, access to land is being increasingly difficult by the conflicting demands of industry, housing, commerce, agriculture, land tenure structures and the need for open spaces. In the past few years, while Addis Ababa has witnessed an amazing horizontal expansion and rapid growth in urban population, it has not been provided with an equal growth in urban public transportation provision which has resulted in increasing private car ownership, high congestion, increasing pollution and large number of accidents and fatality rates; the pedestrians, elderly, disabled and children are being primary victims (ibid).

2.14 Overview of Public Transportation System in Addis Ababa

Urban transportation in Addis Ababa is conducted by a mixture of ownership structures, of which public and private operators are predominantly contenders for business. The modes of urban transportation system in the city are categorized into motorized and non-motorized traffic. As such, the modes of transport include public bus; minibus; taxis and the non-motorized transportation, while walking and animal carts dominate the periphery. Currently, public transportation including Anbessa, Sheger, Public Service buses, Higer mid-buses, Alliance buses, Minibus taxis, Salon taxis and currently the electrified LRT (Light Rail Transit) all together cover about 48 percent while the private mode covers only 9 percent and walking estimated at 43 percent.

In line of this, 2.2 million people in Addis Ababa are using different urban public transportation of which 3.6 million trips happen in the city on daily basis. Currently, the modalities of public transportation in Addis Ababa are limited to road transportation that mainly comprises 7500 white and blue Minibus taxis with a capacity of at most 12 seats, about 460 Higher midi-buses with seat capacity of 22 to 27 passengers, 487 Anbessa city buses (which carry 30 people seated and 70 standing), Public Service buses (blue color) with carrying capacity of 50 passengers seated and 50 hangars), Sherger buses (40 seats and 30 hangers) and Alliance bus (39 seats and 61 hangers) In addition, the 366 supplementary vehicles, and about 6,500 Saloon taxis that seat 4 people and 470 Bajajs. Animal carts are also used at the peripheral areas. These providers are hardly able to cope with public's demand for transportation. As a result, residents of Addis Ababa had to face great inconveniences, as well as additional costs to the daily trips to their destinations.

The ACBE provides bus scheduled during Peak hour, Premium and Special transport services for the City and the surrounding areas from 6:15 A.M. to 10:00 P.M..Additionally, the ACBE gives different technical services to the public transportation service providers in the City. The ACBE buses cover a collective distance of 54,000 km daily and provide their services to about 1.5 million people.

Figure 13.Anbessa City buses
Picture: by the researcher

The ACBE is a publicly owned federal enterprise subsidized by the Addis Ababa City Administration (A.A.C.A.) to meet the transport needs of the poor residents of Addis Ababa. The A.A.C.A. has 487 buses fully functional at the moment deployed along 124 routes. The buses have nearly 30 seats each but carry about 100 passengers at once to meet the transport demands of the low income city dwellers. The buses provide services from 6:15 A.M. in the morning to 9:00 P.M.in the evening. Though they have scheduled running time which is not made public at all, they are characterized by delays, crowding and overloading and low frequency; hence, unreliability and susceptibility for fare evasion. The fares for the buses range from Birr 1.00 to Birr 12.00 depending on the length of routes which is 3 to 5 times cheaper than the taxi's. Therefore, since most of the city residents are poor, the buses are the most exhaustively used means of mobility next to walking (Asfaw, 2000). However, 20% of the population is still too poor to afford this fare (ORAAMP). Table 5 below provides trip distances and passenger fares for ACBE.

Table 5: Fare structure of Anebessa bus as of July, 2016

Distance in kilometer	Fare amount (Birr)
Up to 5kilometers	1.00
5.1to9.0kilometers	1.40
9.1to12.0kilometers	2.00
12.1to 15.0kilometers	2.40
15.1to 18.0kilometers	3.00
18.1 to 21.0kilometers	3.25
21.1 to 24.0kilometers	4.00
24.1 to 30.0kilometers	5.00
47.1 to 50.0kilometers	12.00

(Source: Anbessa City Bus yearly bulletin, 2016)

The Public service (Blue color) bus currently runs 42 routes, with the fleet size or 410 busses, which are assembled locally by MetEC. The Enterprise dispatches buses from Kolfe rapid police, Wingate, Asko lease sefer (Tero), Mikililand, Asko Sansusi and Megenagna stations. There are about 1,640 check points, where passengers get the services. It also has four service centers at

Lideta, where there are workshops, gas stations, stores and offices. The Enterprise has 7,747 staffs at different professional levels.

The fare for the trip covered between 5 km to 6 km is Birr 2.00. The long distance trips ranging between 7 km and 12 km is charged Birr 3.00 and also provides bus transportation services for the Addis Ababa city dwellers during 7:15 - 2:00 A.M. morning hours and between 11:00 A.M. and 1:00 P.M. late morning and early afternoon hours. provides transportation services to public employees' during 2:30 - 4:00 P.M. and during night time, from 1:00-2:00 A.M. provides public transportation services charging the above fares using ticket system for a single trip. These buses cover a collective distance of 19,200 km daily and provide their services to 64,000 public employees and public transport users.

In addition to above bus fleet, Addis Ababa is served by shared taxi with a pleasant appearance of two colors, bottom up blue and white, Andrew Heavens refers them as 'Blue Donkey Cabs' in his article 'My favorite place in Ethiopia, August 2005. A minibus has 12 passenger seats with two operators; the driver and the conductor. The Addis Ababa Transport Authority website shows that there are 7,500 minibuses; all owned by private individuals that are organized through zonal associations provide services of relatively better quality. The Minibus taxi system provides employment opportunities to a large number of people estimated at 50,000. Until 2009, and taxis were not regulated in respect of routes initially. The network in Addis Ababa comprises thousands of independent taxi operators serving a multitude of diverse routes essentially, unofficial bus routes and who often pick up or drop-off passengers on an ad hoc basis. The majority of routes consist of short return-journeys, and operators determine which routes and hours they serve within a zoning system. The operations were demand-driven public transportation system without route maps, timetables or central co-ordination but since 2013 they are regulated by zonal basis.

One of the public transportation services in the city is They start and finish at designated taxi-parks but have no a dropping and loading spaces and so can stop anywhere on the route to pick up and drop off passengers giving priority to the former. The fares for taxi services range from Birr 1.35 to Birr 7.50, depending on the length of the trip. However, 60 percent of the population cannot afford this fare (ORAAMP, 2016).Table 6 below provides trip distances and passenger fares as provided the Mini and Midi buses operators.

Table 6: Fare structure of Minibus and Midi bus Taxis as of July 2016

Distance in kilometer	Fare amount(Birr)	Distance in kilometer	Fare amount (Birr)
Up to 2.5kilometers	1.35	Up to 8.0kilometers	1.85
2.6to 7.0kilometers	2.45	7.1to10.0kilometers	2.90
7.1to10.0kilometers	3.50	11.0to15.0kilometers	3.60
10.1to 12.0kilometers	3.55	16.0to25.0kilometers	3.95
12.1to 15.0kilometers	4.50	26.0to 30.0kilometers	4.50

Source: Addis Ababa City Road and Transport Bureau, 2016

Figure 14.Shared taxis (Mini buses)

(Picture: by the researcher)

Electrified Light Rail Transit(LRT) total length of 34 Km North South line 16.69Km and East West line 16.99Km both the two lines(North - South East-West) line use common tracks about 2.7Km.It has got standard gauges is 1.435m and double track for the whole route. It also has got the capacity of 80,000PP/hr (Passenger per hour).It has got total 39 stations and 41 train locomotives, the fare using paper ticket system for a single trip 2.00 birr up to 8 stations 4.00 birr up to 16 and 6.00 birr up to 21 stations. These locomotives cover nearly a distance of 34 km/trip gives bus transport service from 6:00 A.M. -10:00 P.M.

Figure 20. Light Rail Transit/LRT/
(Picture: by the researcher)

Figure 21. Alliance City bus

2.13 Overview of Urban transport demand characteristics of Addis Ababa

The concept of demand constraints points out to the extent to which a particular mode of transportation is desirable from user's perspectives. Buses and minibuses are often used by employees and students who commute from and to their origins and destination respectively. However, these modes of transportation run, especially buses, at a relatively lower average speed of 15 km/hr due to traffic congestion. There is relatively less number of buses on streets which means that they have a lower service frequency and poor availability during off-peak hours (Bus Network Design and Bus Assignment October, 2016)

According to Mulu E. (2015), the Anbessa buses were mostly used by the low-income population

who travel to work the central business district or reside in the inner city. These vehicles are very old, poorly maintained and lack reliability. The lack of accessibility to public transportation increases the demand for another mode of transportation. For instance, taxis, which operate in the service-gap area, are providing transportation services for 47.3% of the passengers who are not served by scheduled transport providers.

According to Dimtiriou (1990), urban transportation planning is an integral part of the general urban planning and is closely associated with urban land use. Major urban areas have a high level of accumulation and concentration of economic activities and there are complex spatial structures that are supported by transportation systems.

As further stated by Dimtiriou (1990), rapid urbanization process and rising vehicle ownership and traffic in many cities in developing countries has resulted in rising land use densities and expanding areas in which the urban land use and transportation interaction has intensified and traffic overload or congestion, particularly on major transport corridors, has become a recurrent and daily phenomena. Moreover, the construction of urban transportation road infrastructure has resulted in increased cost of land and rent in the central areas and displacement of the urban poor at the periphery resulting in more intra-urban travel and longer average trip lengths. Moreover, high-rise buildings in central areas attract and generate high density traffic into urban roads with inadequate capacity and insufficient parking facilities.

Other transportation-related problems of the developing cities include: parking difficulties, public transportation inadequacy, difficulties for pedestrians, loss of public space through rapid motorization, increased negative environmental impacts and energy consumption, increase of traffic accidents, increase of land consumption by transportation infrastructure and related activities and problems of urban freight movement. The management of rapidly urbanizing of third world cities has become complex, difficult and expensive.

2.14 Background on Urban Transportation of Addis Ababa

Addis Ababa has been undergoing a high rate of urbanization. The city's population is currently growing at a rate of about 2.9% per year and is estimated to reach 5 million by the year 2020. Generally, the urbanization level in Ethiopia is low. Accordingly, urbanization was 11.4% in 1984 which increased to 13.7% in 1994 and is estimated to be 16.7 percent in 2004 Addis Ababa accounts for about 23 percent of the total urban population of the country.

Walking is the dominant mode of transportation in the city. However, its dominance is relatively declining. As indicated in Table 12 below, the modal share of walking was 70% in 1984, decreased to 60% in 2005 and currently stands at 43%.

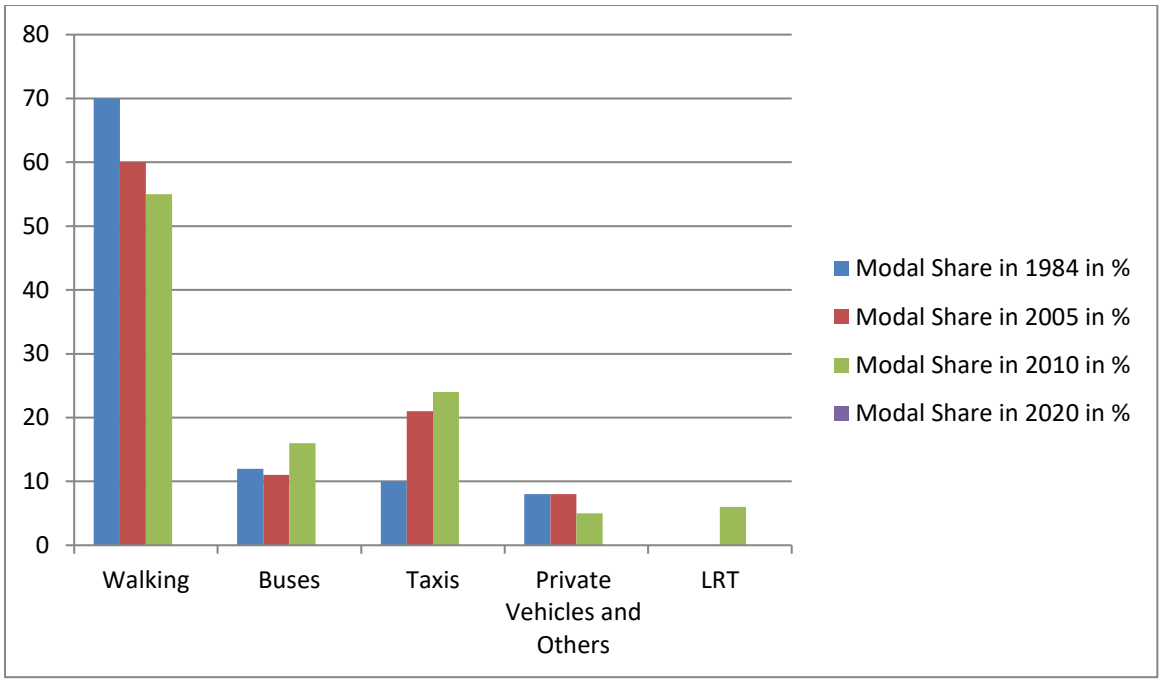

Figure 15.Graph depicting modal share of different modes of transportation in Addis Ababa in 1984, 2005, 2010 and 2020

Table 7. Urban Transport demand characteristics

Estimated daily trips(million)	**4.9**
Estimated modal split: %trips by LRT %trips by public transport %trips by private Vehicle %trips by NMT(including walking)	 6 26 4 64
Share of public transport market: %trips by big bus %trips by minibus/shared taxi %trips by taxi(individual)	 27 72 1
Average journey distance(km) Walk Big bus Minibus/shared taxi	 5 17 7

Source: Bus Network Design and Bus Assignment October, AART, 2016

Table 7: Summary of Road networks, 2016

Surface Type	**Master Plan Road Length (km)**	**Master Plan Equivalent Length (km)**	**Local (KM)**	**Sum**
Asphalt (Exist. & New RR)	499.08	1,577.14	484.2	2061.3445
Cobble	12.74	36.1	547.15	583.24989
Gravel	72.03	223.45	999.37	1222.8239
Paved Stone	1.32	3.41	258.35	261.75714
Natural earth	39.36	111.86	291.35	403.21054
Under Construction	93.17	436.88	436.88	873.76974
Under Construction Cobble			10.11	10.11
Planned Asphalt	233.87	1,029.17	-	
Total	**951.6**	**3,418.02**	**3,027.42**	**5,416.27**

Source: AACRA Planning Department, 2016

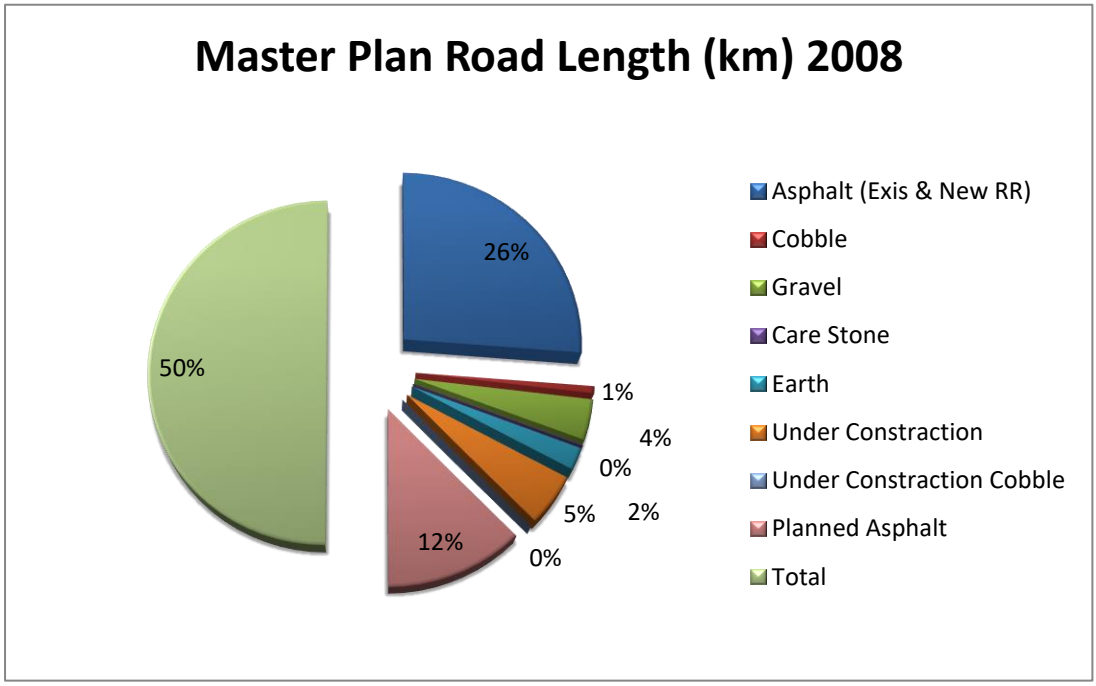

Figure 16.Chart Addis Ababa Master Plan Road Length in (km %)

(Source AACRA Planning and Program Office 2016)

Chapter Three: Materials and Methods

3.1 Introduction

This research explores two of the elements of sustainable development, Land use and transport, focusing on the need for integration of policies in these disciplines in Addis Ababa. These issues are identified as major priorities in most of the national and local strategies and policy documents in Ethiopia and a number of policies are formulated. But the practical picture of the city is getting even worth as each and every land development in the suburbs of the city creates an enormous pressure on the transport infrastructure as a result of not being provided with equal growth in public transport services. This required a study on the trends of policy formulation and stakeholder participation in the city. In addition to the practical situations of policy formulation and implementation in Addis Ababa, theories of policy integration are also explored from different literatures in the same topic in order to address the aims of this research.

3.2 Research Questions and Hypothesis

The main focus of this research will be to explore the needs for integration of land use and urban public transportation supply policies and strategies in Addis Ababa. Therefore, the main research question was formulated as follows:

- How can integration of land use and urban public transportation supply strategies lead to sustainable development in Addis Ababa?

Hypothesis: Since land use and transportation are cross-cutting issues, there is a need for the integration of land use and transportation policies for sustainable development, which is not yet recognized in Addis Ababa.

As discussed before, the interaction between land use and urban public transportation is a complex issue to deal with but not insurmountable. Therefore, to answer the main research question, the first thing to do was to study the policy environment in land use and public transportation supply in Addis Ababa which resulted in the following sub-question:

- How land use planning and urban public transportation are supply harmonized in Mesalemiya-Sefere selam-Asrasement Mazoriya-Lekuwanda area?

Well-designed land use plans always facilitate easy access to public transportation and the accessibility of urban public transportation has impact on modal choice of people. The focus of this research is to study the old and newly developed areas in terms of efficient provision of urban public transportation. Most of the newly developed areas are residential and access to urban public

transportation will serve as a pull factor for business sectors to settle in those areas. But meanwhile, this trend of development will have impact on demand and supply for urban public transportation. This may lead us to the second sub-question:

- What is the current land use trend in Mesalemiya-Sefere selam-Asrasement Mazoriya-Lekuwanda and its impact on urban public transportation supply?

While understanding the policy environment, it will be also important to look at the opportunities and barriers in improving the integration of land use and public transportation supply that could be addressed by this last research's sub-question:

- How can the integration of land use and urban public transportation supply strategies be improved in Mesalemiya-Sefere selam-Asrasement Mazoriya-Lekuwanda?

3.3 Operationalization /Definition of Variables

Table 1 below gives the definitions of dependent and independent variables that are used in the research in terms of the operations or techniques used to measure it. After defining the variables, specific indicators were selected to measure them. The individual variables used in each research question and the methods of measurement are further explained as depicted in Table 2 below.

Table 8: Operational definition of variables

No	Variables	Operational definition
1	Policy	A plan or course of action of a government intended to influence and determine decisions, actions, and other matters (Bitpipe Inc., 2007)
2	Land use	The spatial distribution of activities (H.P. Blijie and De Bok, 2002)
3	Mix/non-mixed land use	Degree that related land uses (housing, commercial, institutional) are located together. Sometimes measured as Jobs/Housing Balance, the ratio of jobs and residents in an area. (Litman, 2005)
4	Land use plan	Refers to the design of various land use factors, such as density, mix, connectivity and the quality of the pedestrian environment (Litman, 2005)
5	Urban public transport	A mass transport system that takes share of urban transport modes
6	Light Rail Transit/LRT/	An electrified rail mass transport system that takes share of urban transportation modalities

Table 9: Research Questions, variables, Indicators and Data sources

Question	Variable	Indicator	Data source
▪ How is the land use planning and public transportation policy processes organized in Addis Ababa?	Form of land use and public transportation supply	• Elements given emphasis on the policies • Stakeholders involved in policy formulation • The level of clarity of the policy structure	➢ Land Administration office ➢ Office of the Revision of Addis Ababa Master Plan ➢ Addis Ababa Transportation Authority ➢ Direct Observation
▪ What is the impact of the current land use plan on the public transportation system in the specific study area?	Impact on public transportation services	The change in demand of public transportation Modal choice	➢ Office of the Revision of Addis Ababa Master Plan ➢ Federal Transportation Authority
▪ How can the integration of land use and transportation policies be improved in the specific study area?	Strategic alternatives for improvement	➢ Barriers for integration ➢ Opportunities for integration	➢ Federal transport Authority ➢ Addis Ababa City Administration Authorities ➢ Literatures

3.4 Research Methods and Strategy

The aim of this research is to analyze the current situation and assess the barriers and opportunities for integrating land use and public transportation policies in the context of sustainable development in Addis Ababa, Ethiopia. Ethiopia is a country in the horn of Africa, being one of the poorest nations of the world in the Sub-Saharan Africa with GDP per capita of $660. Addis Ababa is a high land city located approximately at the geographical center of the country covering 540 km^2 of land area and having a population of over 3 million (5,555 persons/km^2), 60% of which living below the poverty line; according to the United Nations Development Program (Program, 2014).

This study is a qualitative research that will explore the impact of the current trend of development on the public transportation supply system in Addis Ababa and explain how the land use and transportation policies are coordinated to determine the need for integration. Hence, the study combines exploratory and explanatory methods of research.

This research focuses on the study of the contemporary phenomenon of the practical situation of Addis Ababa in relation to land use and public transportation supply trends with the use of a case study as the main research strategy. This strategy includes interviews with stakeholders, including authorities involved in land use and public transportation policy, professionals at different institutions, direct observation of the current trends, and desk studies of organizational records and policy documents. Therefore, the research encompasses primary and secondary data collection.

3.5 Units of analysis

The focus of analysis in this research will be land use and public transportation systems in Addis Ababa. The basic aim of this research is to understand the culture of policy formulation within the overall impact of the city's spatial structure on public transportation so that it will be possible to determine the opportunities and barriers to integrate land use and urban public transportation supply policies in the city with possible replication in other urban centers of the country. Therefore, the main components of the research analysis were: land use , urban public transportation supply in specific study area. Thus, organized data were described using descriptive methods in the form of tables and graphs.

3.6 Data Collection

This qualitative research were based on primary and secondary data to understand the trends of policy formulation and the need for integration of land use public transportation supply system both in specific area and the city;

3.6.1 Primary Data

The primary data were be collected through a field survey during 26, September - 25, November, 2016 along the Mesalemiya - Kolfe - Aserasement Mazoriya - Lekuwanda street in Addis Ababa, Ethiopia. The primary data will be collected using the following two instruments:

a) In-depth interview

In-depth interviews with open-ended questions and semi-structured format were conducted to explore the views, feelings and perspectives of the Addis Ababa transport authorities, land use planners and policy makers of the city and understand the trends of policy making. The interviews were also conducted with pertinent knowledgeable academicians at higher institutions in Addis Ababa. The interview with planners, managers, politicians, bureaucrats and academicians were result in the understanding of the trends of policy making in land use and public transportation, the stake holders involved. The responses were recorded with written notes and audiotape. In addition to the responses, general observations and non-verbal responses of the respondents were also recorded. List of informants, their qualification, questions that were discussed are attached at Annex-4. Table 5.below shows the list of respondents at different government offices and higher academic institutions.

Table 10: List of respondent organization for the in-depth interview

No	Respondents
1	A.A.C.A. Land Administration and Development Authority
2	A.A.C.A. Infrastructure Development and Civil Works Authority
3	A.A.C.A. Master Plan Office
4	A.A.C.A. Light Rail Transit
5	A.A.C.A. Public Transport Service
6	A.A.C.A. Anbessa City Bus Service Enterprise
7	A.A.C.A. Sheger Bus Authority
8	A.A.C. Roads Authority
8	Addis Ababa Road and Transport Authority Public Transportation provision and Coordination Department
9	Addis Ababa University (EiABC)
10	Addis Ababa Science and Technology University

b) Direct observation

A covert observation will be used to understand the ongoing behavior and process of the traffic system at pick and off-pick hours and the trends of land use development in the city as well as in specific area. This unstructured observation will be done in two days at appropriately selected locations in the city, shown below, on seven weekdays and four weekends. This process were focus on the vicinity and the project area where there are large numbers of residential areas developed and being developed to understand the trends of urban development, try to find physical evidence of the impact of the city land use plan on accessibility of different amenities, and the type, amount and frequency of transport modes being used and other features like commuting time to the city center.

The study areas were with large number of residential buildings, both over densities and squatter settlements that have significantly increased the number of households living in that area were given due consideration.

The study areas are purposively selected because of large number of residential building developments and also squatter settlements that have dramatically increased the number of households living in that area.

Field notes were used to record whatever important happenings were observed in an unstructured manner, and a digital photo camera was additionally employed to keep record of observations for later analysis and illustration of the results. See on Annex- 5.

3.6.2 Secondary Data

Data about the traffic condition in Addis Ababa, the trends of development, land use and public transportation policies, regulations, proclamation and directives were explored and collected from literatures and the A.A.C.A and the Federal and Addis Ababa Transport Authority documentation

sections. Practices of other developed and developing countries in areas of transport and land use interaction and policy integration is also discussed in the theoretical part of this research. Table 7 shows types and sources of secondary data.

Table 11: Type and sources of secondary data

No.	Data type	Data source
1	Number of vehicles operating in Addis Ababa by type and age	Federal and A.A.C. Transport Auth.
2	Transport Proclamation No. 468/2005	Federal transport Authority
3	Addis Ababa City Development Plan 2001-2010	A.A.C.A Documentation Section
4	A.A.C.G Executive and Municipal Service Organs Establishment Proclamation No. 2/2003	A.A.C.A Documentation Section
5	A.A.C.G. Revised Charter Proclamation (Amendment) No. 408/2004	A.A.C.A Documentation Section
6	Addis Ababa City Atlas, first edition,2015	A.A.C.A Documentation Section
7	Addis Ababa City Master Plan Preparation, Issuance and Implementation Proclamation No. 17/2004	A.A.C.A Master Plan Office
8	The A.A.C.G. Regulations Issued to Provide Land for Real Estate Regulations No. 20/2005	A.A.C.A. Land Administration and Development Authority
9	A.A.C.G. Structural Plan Approval and implementation Regulation No. 16/2004	A.A.C.A Master Plan Office
10	A.A.C.G. Regulation to Prevent Illegal expansion of Land Possession and Construction on Illegal Possession Regulation No	A.A.C.A. Land Administration and

3.7 Research Population and Sample

The population of the research is the Kolfe Keranio and Addis Ketema sub-cities specifically left and right of Mesalemiya-Sefere selam-Kolfe Aserasement Mazoriya-Lekuwanda with a total number of population approximately 247,839 inhabitants, number of residents which is divided into 7 weredas. The study however focuses on two sub-cities where large number of residential developments and squatter settlements are witnessed. Purposively selected sampling technique was implemented in the study to identify the people involved in land use planning, urban public transportation supply making. The target of the research is to analyze the trends of policy making

and the extent of consideration of transportation policies in land use planning and determine the role of integrated policy making to insure sustainable development in the specific area.

This is a non-probability sampling and the interviewee were selected from related governmental and private organizations /institutions that are involved in policy making, land use planning, urban transportation provision, infrastructure development, real estate development and research activities. See Annex-4.

3.8 Data analysis

3.8.1 Scope and limitations of the study

The scope of the research is the integration of urban public transportation supply and land use policies in Addis Ababa city including the metropolitan areas with a focus on the newly developed and being developing sub cities. There are limitations in this research, in addition to time and financial resource scarcity, as mentioned here below.

One major limitation was that, though it allows the interviewer to clarify points for the respondent, the interview technique relies on the willingness of the respondent to give accurate and complete answers. However, the biggest limitation the researcher faced while the field work was that at under Addis Ababa Transport Office of both sub-cities were going through a basic administrative reform program that it was difficult to talk to the right person, at the right time and with right mood. Unfortunately, people who were not happy with the reform were not willing and/or open to respond to the questionnaires.

Moreover, even if an assistant were employed in the process, researcher's bias could still be a potential limitation to some extent in the observation technique of data collection. Furthermore, though purposively selected sampling technique was used, some authorities usually push the interview to the lower level employees.

Chapter Four: Result and Discussion

4.1. The Real Situation (Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Area)

The Addis Ababa City Charter Proclamation No. 361/2003 declares that the City Administration have the power to issue and implement policies concerning the development of the city. This same Proclamation also gives the City Council the power on issuance of the city master plan and to constitute executive organs of the city. Following this declaration, the land Management Authority, the Infrastructure and construction Works Authority, the Addis Ababa City Roads Authority and the Addis Ababa Transport Authority were re-established with revised duties and responsibilities by the Proclamation No 2/2003. These organs are given powers and responsibilities to develop standards and directives, implement and follow up the same, conduct studies for policy inputs, and facilitate land development and transport provision according to the Addis Ababa City Charter. However, part of this Proclamation that deals with the Addis Ababa Transport Authority is repealed by the Proclamation No. 468/2005. This new Proclamation made the Addis Ababa Transport Authority a branch office of the Federal Transport Authority that is accountable to a Federal Ministry, hence; it is not any more accountable to the A.A.C.A. Council that emphasizes the necessity of facilitating vertical integration of policies.

By the power given by the Addis Ababa City Charter, the A.A.C.A. has approved the City Plan that has four levels: The City development frame work, Structural plans, the Long and medium term City development plan, and Local development plan. The City Development Framework that has the vision, objective and general implementation strategies of the city development plans, is prepared by the decision of the City Government, by coordination of the City manager, and in collaboration with other offices as authority is given by Proclamation No. 361/2003. On the other hand, the structural plan puts and/or indicates general directions, lying out of infrastructure, and land use and organization to enable direct the future development of the city. This way, the structural plan is expected to have clear indications on the mixed housing services, centers and sub-centers, local plan, essential social and municipal services, strategic investment lands, and road and transport services.

In the case of the empirical study, it was understood that at the preparation stage of the master plan two teams were formulated to lead the process. These teams were technical advisory committee that was composed of sector agency representatives who were department heads of relevant sectors including the A.A. Transport Authority, and a steering committee that includes the President of the Oromiya regional State, the A.A. City Mayor and other high position managers such as, Works and Urban Development Authority, and the Addis Ababa Economic and Development Authority.

However, according to the respondents, the involvement of the then A.A. Transport Authority was limited to giving suggestions on some issues in the way of the development of other elements of the master plan. This shows that the A.A. Transport Authority didn't have the power to influence the

decisions on the land use allocation and the overall master plan preparation by forecasting the travel demand that will be generated as a result. In fact, one of the interviewee from the A.A. Master Plan Office revealed that they never had any scheduled meetings with the Transport Authority but only few ad-hoc meetings as the need arise from either side. This was confirmed from the side of the Federal Transport Authority interviewee who said that the contact should be with the A.A. Roads Authority but not with the Transport Authority. The idea for defense was that, if every new development is provided with road infrastructure, the transport services will follow the development. But this doesn't work well for a city, which is a national economic motor, crawling with incapacitated transport services and road infrastructure covering 19.1 percent of the built-up areas out of which asphalt accounts for only 2,061km of the total road length. This is a clear indication of authorities whose duties and responsibilities are not clearly stated and/or understood.

This could be quite amazing since the objectives of the Transport Authority, as stated in the Transport Proclamation No. 468/2005, include promoting an efficient, adequate, economical and equitable transport system, ensuring that public transportation services are safe and comfortable, and promoting the development of all aspects of transportation. In fact, the city doesn't have any white paper entitled 'transport policy' so far but is run by proclamations, regulation and reaction to immediate concerns as curative measures. The interview with the authorities show that most of the regulations on urban public transportation are set in a way to extinguish the fire without deep understanding of the causes of problems and finding a reasonable solution which usually back- fire. A very recent proof for that is the regulation that changed the number of passengers allowed to board on shared taxis to relief the pressure and the other that allowed mini buses without blue and white colors to provide taxi services in the city. These rules are not put in black and white but are working 'well' by what the authorities call 'understanding'. These decisions did not involve other stake holders within the A.A.C.A. or other transport experts, but are speculative and desperate decisions by the authorities. This fails the notion of good governance which is an inclusive process that encourages involvement of all relevant stakeholders in decision making from the outset hence not sustainable.

On the contrary, the Addis Ababa Master plan preparation was better in encouraging participation from all related stakeholders within the country and abroad. Proclamation No.17/2004 states the City Resident's participation in the preparation of the structural plan; however, the real picture shows it was, in a way, even more participative. A number of workshops, public meetings, and discussion and consultations forums were held with all responsible stakeholders throughout the process. The interviewee stated, that among these workshops and meetings; Vision of Addis Ababa workshop, Public discussion forum and exhibition, Design Addis workshop, and Addis 21 international conference could be mentioned as the most successful. This, according to the respondents, was the most important part of land development as land is very

sensitive issue to all parts of the society including the A.A.C.A. Authorities, Federal authorities, Oromiya Regional Government, the civil society, NGOs, Embassies, CBOs, Professional associations, and Religious organizations, that have their own interests (See Annex3 for the list of all stakeholders involved in the master plan preparation process). This was mentioned as the strongest point of the A.A. Master Plan by most of the respondents since it will create belongingness and sense of ownership in the society. However, this has resulted in some complications as well. One of the problems mentioned by the respondents is the very long process of design and approval as efforts were being made to involve as many stakeholders as possible through forums, meetings and mass media that required time. Thus, the sub-city administrations were giving land to investors before the completion of the structural and local development plans that causes worries among the authorities as this might hinder mobility in the near future.

The revision of the Addis Ababa master plan was initiated by the large population growth, rapid economic development of the city and income growth which couldn't be served by the 1986 plans. But, the interview with the authorities involved in master plan preparation discloses that the transportation issues were addressed by the planning exercise of senior urban planners but not by transportation experts. Most of the respondents admit that the absence of any transportation expert to analyze and predict the impact of the proposed land use plans on urban public transportation in the future as one of the main weaknesses of the new A.A. master plan. However, expansion of road networks for efficient streets and issues of providing affordable transport, enhanced access and mobility are among the ten elements given emphasis in the master plan, at least on paper. On the contrary, it was learnt that there is not even a single land use elements on the 2005 transportation proclamation. This shows that the Transport Authority failed to consider that spatial distribution of different human activities does lead to need for travel and transport of goods as stated by COST (1996), hence, will have impact on the mobility if not planned ahead.

The interview also showed that the Land Development and Administration Authority doesn't consider the impacts of the city land use allocation on transport demand and modal choice in the city, and definitely not the Infrastructure Development and Civil Works Authority. The primary objective of the Infrastructure Development and Civil Works Authority, as stated in the Proclamation No, 2/2003, include issuing construction and consultation licenses for all kinds of construction projects, supervising the construction process, and assuring coordination and cooperation among other amenity and infrastructure providers. However, while issuing the license, the Authority assumes that all the required amenities and infrastructure availabilities including future transportation requirements are already checked by the Land Development and Administration Authority prior to allocating the land for the assigned purpose. Whereas the truth is that, while administrations require developers to provide hospitals, shops, infrastructure for public services, etc, nothing is said at all about transportation provision or creating employment

opportunities which obviously demonstrate the gap in horizontal coordination of authorities. This could apparently be the result of lack of clear institutional settings and interdepartmental coordination with in the A.A.C.A. Sustainable development of a city requires authorities to be concerned about how people and goods can efficiently get to the new premises while allowing development of an area.

Apart from this, the interaction between the A.A.C.A. and the Oromiya Regional State was mentioned as one of the major constraints of sustainable development in Addis Ababa. Regarding the relation of the A.A.C.A. with the Oromiya Regional State, Proclamation No.361/2003 states that the City Government shall have such relationship with the Oromiya Region as rests on fruitful cooperation and, of course, the special interests of the Oromiya region shall be respected as provided by the Constitution. This has given the city administration a very difficult task in controlling the expansion of the city as large part of the city metropolitan area is administered by the Government of the Oromiya Regional State (G.O.R.S). As pointed out in the introduction, the A.A. metropolitan area is the economic motor of the whole of the Oromiya Region taking a share of more than half of the region's investment capital. As a result, land use conflicts and undesirable developments have been witnessed at the expansion areas of the city because of lack of appropriate regional policies, inter-organizational and planning coordination, and proper institutional settings. In fact, the interviewee attributed that one of the reasons that are responsible for hastening the squatter settlements and sprawl development at the peripheries of the city is the huge difference in land prices between the two regions as the land prices of the A.A.C.A. reaches about 100 times higher than the price given by the Oromiya Regional State in adjacent neighborhoods.

This failure to integrate development policies between the two regions is demonstrated by the high magnitude of investment and urban growth by the Oromiya Regional State in the metropolitan areas of A.A. which, according to the respondents, is done without prior investigation of its concordance with the city system. This aggravates the urban public transportation problems of Addis Ababa that was already limping because of the internal affairs of the city since the G.O.R.S play a role in provoking the demand for urban public transportation while the supply side is left for the A.A.C.A as a result of dearth of inter-territorial integration among regions. A study on 150 cities in developing countries shows that for every additional 1,000 people, there is an increase of 350 to 400 public transport trips, similarly, every square km growth of the city generates 500 public transportation trips per day (Transport Research Laboratory, 2002). The impact is obvious while both phenomena are taking place simultaneously in a city characterized by poor infrastructure and incapacitated urban public transportation supply system.

As supported by the findings of the interview, even if large scale of the development process in Addis Ababa is affected by factors not controlled by the land use policy of the city like

informality, market forces, political issues and lack of comprehensive integrated regional policies, the formal settlements and development directives of the Addis Ababa Master plan also shows segregation in land allocation that hinders mobility in the city since land-use planning done without sustainability in sight leads to sprawl .

The Addis Ketema sub city is one of the oldest and the most influential sub city which is located in the North Western part of Addis Ababa. The sub city covers an area of 8.64 hectares and divided into 10 Weredas. In terms of relative location, it is bounded by Gulelie sub city in the North, Lideta sub city in the South, Kolfe Keraniyo Sub city in the west and Arada Sub city in the East. Since the sub city specifically one part of the study area is located in the inner and deteriorated part of the city, it's exposed to different problems manifested by over crowdedness, congestion, building obsolescence, and deterioration of urban facilities.

On the other hand, Kolfe Keranio is one of the new sub cities which are located in the North Western part of Addis Ababa. The sub-city covers an area of 634.8hectares and is divided into 15 weredas. In terms of relative location, it is bounded by Gulelie in the North, Lideta in the South, Oromiya in the West and Addis Ketema sub city in the East. Since the sub-city is located at the fringe of the city, it's exposed to different problems manifested by over crowdedness, congestion, building obsolescence, and deterioration of urban facilities.

The west of Addis Ababa, specifically the Mesalemiya-Aserasement Mazoriya-Lekuwanda areas, is meant to be dominated by residential and commercial activities. However, there is still huge cluster of residential housing developed and being developed in the vicinity, most of which is classified as informal settlement. It has been observed that, there is an increasing demand for urban public transportation in these areas. Moreover, the area is usually characterized by high level of congestion and pollution as it is the main gate for Ambo, western part of Addis Ababa which is one of most economic activity centers of the country. Observation done by the researcher in these areas show that less than 20% of the vehicles in the main road going from or coming to this areas are transit while 70 % of other vehicles carry only one passenger at pick hours. This has increased the pressure on the urban public transportation supply and mobility while at the same time worsening the congestion and the pollution level at area. The Aserasement Mazoriya Roundabout is major delay point for the flow of traffic as well as urban Public transportation Supply approaching on street section starting from Mesalemiya-Lekuwanda. The existing capacity of the intersections is low due to poor traffic management and geometric features.

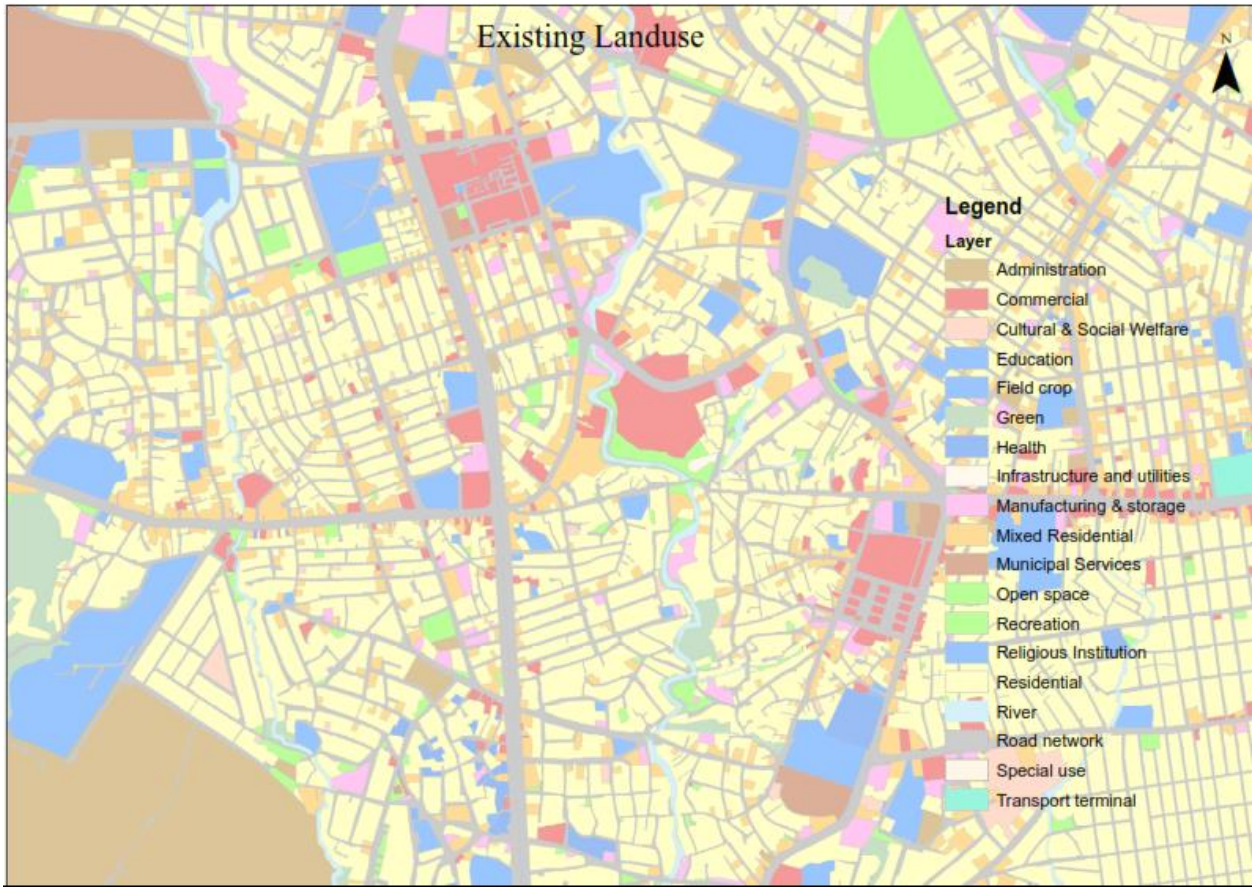

Figure 17.Shows Existing Structural Plan of Addis Ketema-Kolfe-Aserasement-Mazoriya-Lekuwanda area

(Source: AACALMO, 2015)

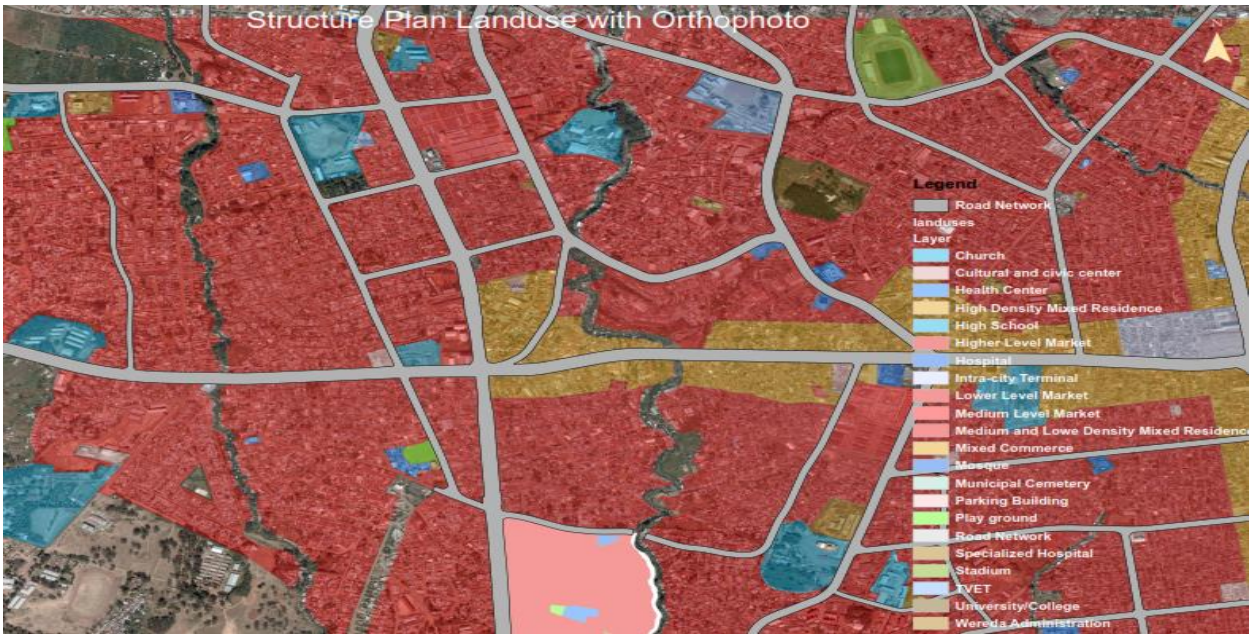

Figure 18.Shows Proposed Structural Plan of Addis Ketema-Kolfe-Aserasement-Mazoriya-Lekuwanda area

(Source: AACALMO, 2015)

4.2 Land use and Transport Policy Documents

The main urban public transportation and land use related documents that are being implemented in the A.A.C.A. and used in this study are presented in table 13 below. The table gives description of the contents of the documents and their weak points in terms of the land use-transport interaction of a vibrant city.

Table 12: Land use and Transport documents in Addis Ababa

Document	Description	Remark
A.A.C.G. Revised Charter ProclamationNo.361/2003	Objectives, Government Structure, Power and Responsibilities of the A.A.C.A.	
A.A.C.G. Executive and Municipal Organs Establishment Proclamation No. 2/2003re-amendment ProclamationNo.20/2004	Establishment, Organization, Power and Duties of the Executive Organs with in the A.A.C.A.	No clear demarcation of duties and responsibilities
A.A.C.G. Master Plan Preparation, Issuance and Implementation Proclamation No.17/2004.	Content, Preparation and Determination of Plans at all levels	Information is limited to Public Participation
A.A.C.G. Structural Plan Approval and Implementation RegulationNo.16/2004	Approval and Implementation of the Structural Plan	Information on land use, road network ,major social services, strategic investment location, environmental protection
Transport Proclamation No. 468/2005	Establishment, Objective, Power and Duties of the Federal Transport Authority	No land use elements
The A.A.C.G. Regulations issued to provide Land for Real EstateregulationNo.20/200	Land Prices, Issuance of land, Objectives, Requirements for Real Estate developers	No public Transportation element
A.A.C.G. Building Permit RegulationsNo.17/2004	Procedures for the issuance of construction permit and general requirement of design and plan	No public Transportation element
A.A.C.G. Regulation to prevent illegal expansion of land possession and construction on illegal possession Regulation No.14/2004	Preventive and Corrective measure on illegal settlement	Opaque in terms of identification and implementation Regulation

4.3 Data Analysis

The empirical part of this study answers the first two research sub-questions:

1. Organization of the land use and urban public transportation supply policies
    a. Who leads the process of policy formulation?
    b. Who is involved in the process of policy formulation?
    c. What elements are given emphasis in the policies?

2. The impact of the current land use trend on urban public transportation supply of the Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Street is based on:
    a. Who allocates land for development?
    b. Who decides the land use of a plot?
    c. What is the impact on the urban public transportation supply system as using a result inferential mathematics?

These questions will be answered in two different sections. The first section looks at these questions from the perspective of policies, plans, proclamations and regulations. Therefore, the focus of this first stage will be limited to the consequences of the development process as proposed by the policy. On the other hand, the second stage of the data analysis will look at the practical land use development of specific area and its impact on public transportation supply which will not be limited to the formal development process of the specific area and the third sub question will be part of the conclusion and recommendation of the research.

Table 13: Population, age and density of the study area

S.No	Sub city	Area hectare	No of Wereda's	No of House holds	T. Population	Population density /Km^2	Sex		Economically active age Group/10^+ to 65^+	Employment Status	
										Emp.	Un emp.
1	Kolfe Keranio	634.8	15	124,585	524,759	7,879	M	260,280	150,372	130,452	19,920
							F	264,480	121,989	74,257	47,733
2	Addis Ketema	8.64	10	65,190	275,798	34,467	M	133,889	78,618	60,760	17,858
							F	141,899	64,063	38,047	26,016

(Source: Addis Ababa City Atlas first edition 2015, Statistical report on the 2013 employment survey of Addis Ababa, May 2014)

Table 14: Total Population of Sub Cities of Addis Ababa by Number of Households and Average Household Size

Household and Population Size	Household size											Average Household Size
	Total	1	2	3	4	5	6	7	8	9	10+	
KOLFE KERANIYO												
Households	124,585	10,764	16,949	22,965	20,895	22,349	13,954	8,478	4,094	1,950	2,188	4.2
Population	524,759	10,764	33,898	68,894	83,578	111,747	83,725	59,346	32,748	17,549	22,509	
ADDIS KETEMA												
Households	65,190	9,136	7,919	9,402	10,781	10,970	6,528	4,616	2,784	872	2,182	4.2
Population	275,798	9,136	15,837	28,207	43,124	54,850	39,168	32,310	22,276	7,850	23,040	

(Source: Addis Ababa City Atlas first edition 2015, Statistical report on the 2013 employment survey of Addis Ababa, May 2014)

4.4 Existing Land use

The study area encompasses the Weredas of 4, 8, 9 and 10 of the Addis Ketema sub-city. It is located around commercially influential neighbors like Ehil Berenda, Mesalemiya and Efoyta market and the Kolfe Keranio Sub city Weredas of 10,11and 12. According to the existing structural plan, the research area LDP land use is dominantly covered with residential and commercial areas. The newly proposed structural plan LDP land use promotes to be medium and high density mixed residence.

The existing land use of the influence area versus the proposed structural plan is mixed use. Currently, the area is mostly used for residence, mixed residence and Administration. The above are followed by commercial, activities and a road network respectively. Furthermore, it was observed that children usually play on streets and around their homes.

Good health and urban planning are closely linked. It is absolutely impossible to achieve good health in urban centers without integrated settlement planning. Coupled with poverty and bad sanitation, lack of proper urban planning significantly contributes to poor health in cities. According to the sample survey, the majority of the respondents earn monthly income ranging from Birr 1201 and above and most of the respondents are privately employed. According to the sample survey, 18.85% of the respondents were unemployed, 84.4% lacked enough capital for investment and 15.6% expressed lack of information on engagement.

According to the observation, there are three governmental and few private health institutions in the study area. Therefore, the LDP harmonization will be concerned to achieve the required density based on the new structural plan. The new structural plan has given more emphasis to residential development. It's all about bringing high residential density at the area to accommodate the upcoming population.

The building heights, according to the new structural plan are 3-5 stories on the West and 5-8 stories on the North of the study area. The rest of the research area lies under the regulation of the rest of the city. Action area versus the structural road do have CS-2 road from Mesalemiya-Asrasement Mazoriya and PAS-4 road from Aserasement Mazoriya-Lekuwanda.

Additionally, there are changes on the building height regulation. It's designed to achieve the required density and to be managed by /Floor Area Ratio/FAR/ by setting maximum number of floors for some areas and at the same time only minimum number of floors at some areas. Table 4 below shows Proposed Zoning and building Height Regulation Provision.

Figure 19: Shows the existing land use of the specific study area

(Source: Addis Ketema and Kolfe Keranio Sub-city)

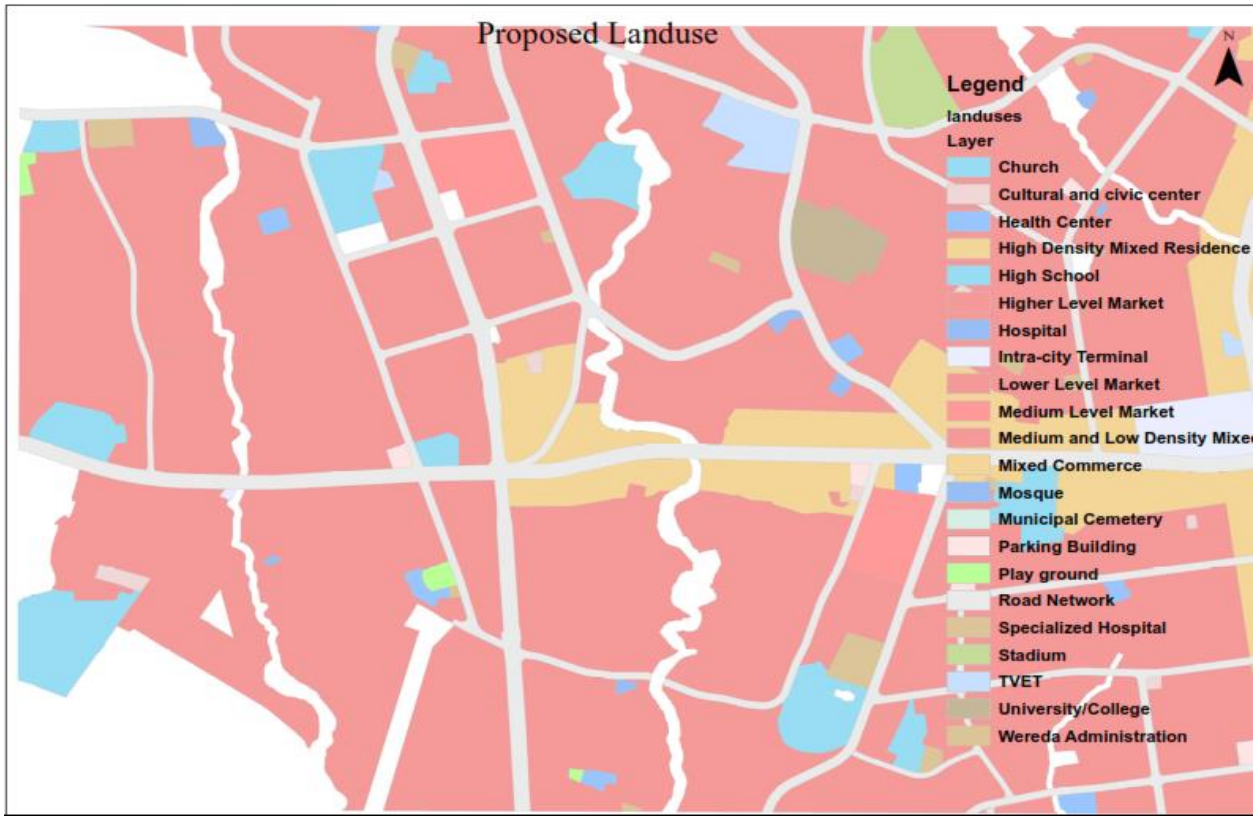

Figure 20. Shows the Proposed land use of the specific study area

(Source: Addis Ketema and Kolfe Keranio Sub-city)

4.4.1 Action Area Vs. Structure Intervention

The research area is located both at the fringe, inner and deteriorated part of the city. It's exposed to different problems manifested by: over crowdedness, congestion, building obsolescence, and deterioration of urban facilities. According to the new wereda structure, the research area lies in two sub-cities covering 436.13 hectares. The total population size of the study area is currently estimated about 247,839. Identifying the major physical and socio-economic problems of the research area helps to solve them.

In order to acquire the desired data, structured questionnaires were developed and distributed to pertinent entities using systematic random sampling technique to 276 households out of the total 49,568 households, which covers around 1.0% to gather the profile resources such as education, occupation, income and other relevant information's.

The land uses within the segments of research area are residential, residential and commercial, public and semi-public, schools and animal yard, around the so called Mesalemiya to Aserasement Mazoriya. Mostly from Aserasement Mazoriya to Lekuwanda, the land use system is almost similar with the other urban land use characteristics. Therefore, this land use feature should affect the traffic congestion occurring on the subjected route of Mesalemiya-Kolfe-Aserasement-Mazoria-

Lekuwanda. More or less, the right-of-way of the land use of the study area was observed to cause traffic congestion. Table 15 below shows the land use feature of the study area.

The structural plan proposes the action area as an upgrading intervention asillustrated on the map. In addition, as we see the study area versus structural centrality, it is located at some three km distance from the main market center (Merkato).Additionally, observing action area versus the structural buffer, the study area is bordered by a river basin on the east and on the west, it is proposed as structural buffer. Table 15belowshows the existing land use of the study area under the two sub-cities.

Table 15: Zoning and building Height Regulation Provision

No	**Zone**	**Building Height**	**FAR**
7.1.1	Zone One	Minimum G+19 or 70m and Free upper limit	Minimum 10 and Free upper limit
7.1.2	Zone Two	Maximum G+19 or 70m	7-10
7.1.3	Zone Three	Maximum G+9 or 35m	1.5-7
7.1.4	Zone Four	Maximum G+5 or 21m	0.75-3
HS	Historical Sites	Maximum G+9 or 35m, and in accordance with urban design proposals	1.5-7
GF	Green Frame	Maximum G+5 or 21m for city parks no construction allowed in other green frame.	0.05

(Source: Addis Ababa Land use Guide book 2014)

Table 16: Existing Land use pattern of the Influence area

S. No.	**Existing Land Use**	**Addis Ketema /Weredas 4,8,9,10 /**		**Kolfe Keranio /Weredas 10,11,12/**	
		Area (ha)	**(%)**	**Area (ha)**	**(%)**
1	Administration	813.91	0.58	54.97	18.58
2	Commercial	12096	8.62	3.225	1.09
3	Cultural and Social Welfare	336.79	0.24	0.932	0.315
4	Manufacturing and Storage	4911.6	3.5	7.662	2.59
5	Municipal Services	813.91	0.58	15.26	5.16
6	River	2582.1	1.84	0.908	0.307
7	Recreation and Open Space	3339.9	2.38	5.473	1.85
8	Under Construction	1501.5	1.07	1.006	0.34
9	Urban Agriculture	322.76	0.23	0	
10	Education	11226	8	9.91	3.35
11	Green	2764.5	1.97	27.54	9.31
12	Health	2062.9	1.47	1.438	0.486
13	Infrastructure and Utility	56.132	0.04	0.077	0.026
14	Mixed Residential	10244	7.3	16.22	5.483

15	Religious Institutions	2989	2.13	6.485	2.192
16	Residential	54027	38.5	99.97	33.794
17	Road Network	29469	21	44.74	15.125
18	Special Uses	547.29	0.39	0	
19	Transport Terminal	252.59	0.18	0.005	0.0018
TOTAL		**140,330**	**100**	**295.8**	**100**

4.5 Physical Aspect

4.5.1. Topography and Slope Analysis of Specific Area

The main physical features on the ground are: rivers, lakes, reservoirs, roads, forests or large rocks and the various features of the fish-farm, such as ponds, dams, dikes, drainage ditches or sources of water. There are differences in height between the land forms, such as: flat, rolling and valleys, plains, hills or slopes. Differences had been surveyed on the segments, based on the gradient that may cause traffic congestion along the segment between Mesalemiya and Lekuwanda.Figure 25 below shows some pectoral views of the study area.

Figure 21.Pictorial views of the study area

(Source: Researcher)

Based on the count data of UNICON, the AADT of the Mesalemiya-Lekuwanda street varies from 6892 near Kolfe roundabout to 3566 at the Kolfe Bridge. It is composed of 28 % private vehicles, 47 % Mini/Midi buses, 2% large Buses and 23 % Small Trucks/Trucks/trailers. The total hourly volume is higher at the late afternoon than in the morning hours. As is observed from the directional split, the outgoing traffic volume is higher than the incoming traffic between 8:00 hours up to 17:00 hrs; however, during the night, the incoming traffic is higher than the outgoing traffic. The directional split varies from 60:40 to 42:58.

The Intersection is currently a roundabout with 25 m Central Island, and 46 m inscribed circle diameter with two lanes at three approaches and one lane at Merkato approach. As per the study in 2008 by the consultant, it has a total intersection entry volume of 1773 vehicle per hour for a capacity of 7050 vehicles per hour. The Merkato approach has excess delays due to narrow one lane approach width and conflicting pedestrian volumes. The demand volume could increase to 5320 vehicles per hour in 2032. The pedestrian volume is also estimated more than 400 pedestrians per hour. For increased pedestrian volumes and tripled vehicular volumes the average volume to capacity ratio could reach 0.8, with higher delays at some legs.

It was observed and surveyed that 44.7% of the site has a slope between 4-7% which is very good for development. The terrain type of the street is flat and rolling which is good since topography in respect of terrain affects the speed of vehicles and cause congestion. The speed of vehicle on such type terrain shall be relatively higher and never cause congestion.

Generally, one can conclude that the Kolfe RR round about is major delay point for the flow of traffic at the Mesalemia-Ambo road and the Ring Road. The existing capacity of the intersections is low due to poor traffic management and geometric features.

Additionally, it was observed and surveyed that 44.7% of the site has a slope between 4-7% which is very good for development. The terrain type of the street is flat and rolling which is good since topography in respect of terrain affects the speed of vehicles and cause congestion. The speed of vehicle on such type terrain shall be relatively higher and never cause congestion.

4.6 Social Aspect

4.6.1 Population

According to the information obtained from the Wereda Administrations of the two sub-cities and data from (CSA census 2007), the total population under the influence of the Study Area is estimated at 49,001 households with an average household size of 5, thus the total being about 247,839.

Table 17: Population, area, and density data of the study area

Kolfe Keranio					Addis Ketema							
Kebele	08,09		10,11		08,09,18		10,11,12		16,17		12	
Wereda	10		11,12		4		8		9		10	
Area in Hec.	182.9		112.93		11.98		74.11		53.61		12.61	
	M	F	M	F	M	F	M	F	M	F	M	F
Sex	24,084	23,384	30,460	29,581	19,537	19,026	25,810	27,471	15,696	17,592	7,540	7,658
T.P.	47,468		60,041		38,563		53,281		33,288		15,198	
Pop/ Hec	260		532		3219		538		424		1205	
G.T.	247,839											

(Source: CSA 2007 for 2015 Projection, Kolfe K. and Addis Ketema Sub cities Land development office)

4.6.2. Existing Housing Condition

Most of the existing houses in the site are G+0 which are constructed from mud and wood. Most of them serve for residential purposes and the rest incorporate small scale commercial entities within a plot such as: shops, boutiques, fruits and vegetables houses, kiosks and cafes. The existing houses could be grouped into three according to their conditions of showers, bed room and living rooms as good, fair and bad. The majority of the site has grid and irregular types of street network system. The street hierarchy contains: Arterial (30 m), collector (7-8 m), Local (5m) and access roads with less than 3m width. The following were observed:

- Irregular and scattered arrangement of the buildings within the plot;
- relationships between the built up and un built area in the site;
- Sizes of the buildings within the plot;
- alignment of the buildings with the streets;
- Congested residential blocks and plots without standards;
- The site contains three types of block typologies. these include:
  - ✓ rectangular block;
  - ✓ triangular block; and
  - ✓ irregular blocks

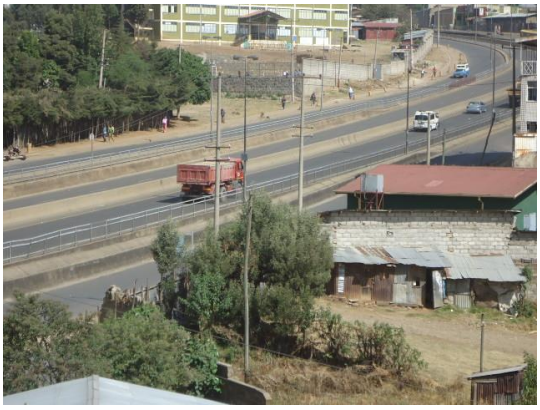

Figure 22.Partial View of Residential areas of the research areas

(Source: Researcher)

Even though most of the blocks are residential blocks, it is not up to the standard and scaled to pedestrians which deny the street users to easily access some places. Table 17 below shows the distribution of the condominium houses in the two sub-cities that are expected to relief the housing problems of the city as part of the 2017/2022 A.A.C.A. urban renewal program.

Figure 23. Long queue of urban public transportation users waiting for transportation service

(Source: picture by the researcher)

Table 18: Distribution of condominium houses by sub-city

Sub-city	No. of sites	Condominium area in hectare
Addisketema	8	4.93
KolfeKeranio	12	91.64
Total	**20**	**96.57**

(Source: Addis Ababa City Atlas, 2015)

Even if this has become a common phenomenon in most parts of the city, the condition of the Addis Ketema sub-city, with special focus on Mesalemiya and Kolfe-Asrasement Mazoriya areas is getting worse every time because of the increasing high-density residential development activities in the existing area which is opposite from the proportional mixed land use structural plan. This area is characterized by a high number of residential developments as shown in Figure 29 and 30 above shows still a large area has been earmarked by the structural plan considered as mixed use area of residential settlement. As observed, the problem in these areas does show that the narrow road width, the poor road quality and inadequate road network have made traffic congestion, especially at pick hours, as the common character of the area.

However, according to the (IBIS Transport Consultants Limited 2005), the problem on transit dependent society is even worth as both taxis and buses do not come frequently because of traffic congestion. In general, only 6% of the Anbessa bus routes have a frequency of 6 or more per day which is the standard frequency for urban bus services, 29% have 3 to 4 services, 35% have 2 buses an hour and 20% of the routes have a frequency of only 1 bus every hour. These percentages do not add up to 100%.

As mentioned by (Newman, 2007)cities with denser land use patterns support more transit and other non-motorized transport options while in low density cities there is little alternative for transport. As demonstrated in Table 15, 16 and Figure 29, 30, the two sub-cities under study cover 14% of the total land area of the city while accommodating only 7.8% of the city's population. Therefore, the average population density of these Weredas is 260,532 in Kolfe Keranio wereda 10, both 11 and 12. Addis Ketema 3219,538,424 and 1205 people in wereda 04, 08, 08 and 10 per hectare respectively. The densities of the study area Weredas are by far greater than the city's average density of 615 people per hectare. Hence, it makes the provision of conventional infrastructure and services inefficient (Administration, Addis Ababa City Atlas,first edition, 2015); (CSA, Statistical report on the 2013 employment survey of Addis Ababa, May,2014).

However, the respondents expressed that: easy access to large plots, availability of clean and green environment, extensive infrastructure, relatively short distance to the inner city, availability of cheap rental houses, and dynamic investment activities attract more residential development in the study area. This can be explained by the economic concept of 'option value'. It is that most people value having possibility to access different services and amenities, even if in the real life they don't usually use them. A simple example is that people like to live in areas where they have access to a park whereas in reality they don't use it (Wee B. u., 2000).

Failure to consider the land use impact on urban public transportation has also been demonstrated by the transport problems aggravated due to the construction of the ring road splitting Kolfe-Keraniyo and Addis Ketema sub-cities. As stated by two of the respondents, as the result of inappropriate planning and faulty design, people living in a huge cluster of residential settlements in Kolfe, west of A.A., are hold back from easy access to urban public transportation. Besides it was observed that as a result of the problem, people are either asked to pay a significantly higher fare than they used to pay or forced to switch three taxis to get to the inner city.

This is the consequence of the high way built within the city and goes between neighborhoods that closed their only access road to public transport adding to the utter miseries caused by poor urban public transportation supply network of the city and made them vulnerable to traffic accidents while informally crossing the highway. Figure 28 below illustrates these unfortunate circumstances. Besides, people have to live with the increasing level of air and noise pollution from vehicles. One

of the officials added that if the land use trends of the area were taken into consideration while constructing the high way, it would have been possible to build an efficient transit system that creates vibrant, livable community concomitantly saving time, energy and improving the environment.

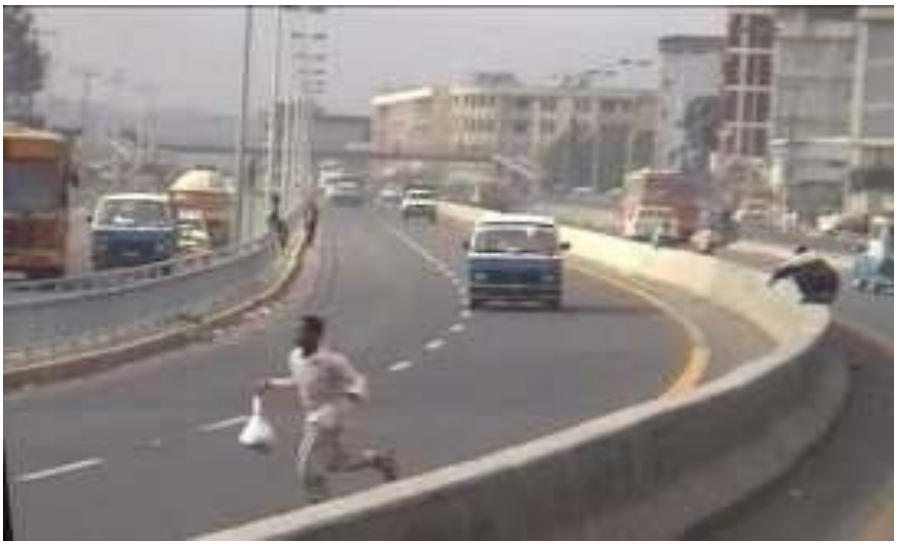

Figure 24.Accessibility problem occurred as a result of the ring road construction
Source: Researcher

This is not the only land use and public transportation related problem of this area. According to the respondents, it is common to come across people that fence part of the backstreet and claim as their properties. The explanation could be that most people settle in this area trading accessibility to different opportunities and urban public transportation system for large plots as they value living in spacious houses most. About sixty-two percent (61.7%) of the houses in Kolfe-Keranyo sub-city are each within a total area of more than 175 square meters, which is the maximum allowable plot under normal circumstance (Meles, 2005). Besides, the failure of the land use and the transport authorities to enforce laws and regulation at such conditions gave the chance for these people to abuse the law. This is what Wee (2000) mentioned as 'peoples valuation'; i.e. people living in this area value spacious plots more than access to amenities.

The main problem is that only few buses are assigned to provide service for a large area over a long service route. As a result, most shared taxis and Anbessa buses arrive at major stops midway on the carriageways of the road over crowded that they can't board any more passengers. It was observed that taxis in this area usually board 14 to 18 passengers, while by law they are allowed to carry only 12 passengers. Looking at the huge residential development, as proposed by the master plan, the respondents anonymously agree that it is very necessary to assign buses that will begin at few major stops on this route at least at peak hours. Moreover, mobility could be improved by providing infrastructure for non-motorized transport to relief the public transportation that is already stretched to its limits.

In general, the structural plan of the city shows that, large proportion of the amenities including the main central market, main business centers, commercial areas and centers, public transportation lines, general hospitals, and fire brigade stations are concentrated in the inner city. Besides, because of the poor urban transport network in Addis Ababa, anybody who wants to cross from the southern to the western end of the city by public transport has to get to the inner city first. This is shown by the large proportion of the routes operated into the three main terminals in the inner city (Addis Ketema, Legehar and Menelik Square) that take 70% of the operating routes, i.e. 62 of 89 (IBIS Transport Consultants Limited, 2005). As a result, trips are converged to the city center from Lekuwanda that is from the fringe of the city where most residential developments are sprawled. This trend of development is unfavorable to the provision of efficient public transportation and other sustainable transportation modes but rather urban sprawl causes high level of private vehicle use (Carplus, 2004). In comparison, a more compact and mixed land use patterns bring together activities that are complementary to each other and encourage walking (that accounts for the larger share of urban mobility in the city) and cycling, while allowing affordable and efficient transit provision.

4.7 Existing Street Network

The existing street network has problems with regard to connectivity and, suitability for road users and these are:

- Inaccessibility due to congestion at CS and LS;
- Connectivity problem cul-de-sac at LS;
- Congestion and over crowdedness at collector streets due to narrow right of ways of LS; and
- Lack of hierarchy at some edges like local streets join the arterial street that runs from Mesalemiya to Aserasement Mazoriya.

Even though the Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda Street is paved with Asphalt Concrete materials the right of way isn't as per the hierarchical standard due to several reasons like:

- Absence of appropriate drainages and sewer lines beside the streets;
- Narrow right-of-way of the street causes overcrowding and congestion creating difficulties in the provision of widening curve radius and different types of pavement distresses. The existing street contains several types of approaching junction; the major ones are:
  - T- Junction;
  - Y- Junction;
  - Acute angle; and
  - Irregular junction.

Regarding the existing streets with different hierarchy, the junctions are not as per the standard and not suitable for different sizes of vehicles due to improper planning and illegal expansion. All of these lead to catastrophic traffic accidents and significant traffic congestion, delay on traffic movement. The majority of the study area street is not as per the standard hierarchically and

category network system. Generally, the areas do have hierarchy containing: arterial (30 m), collector (8-13 m), local (5 m) and access streets with less than 3 m width. The existing street network has problems with regard to connectivity, convenience for street users. Connectivity problem streets are mostly with dead ends called cul-de-sac at Local Street LS level. Lack of hierarchy is observed at some edges like a Local Street joining the Arterial Street that runs from Mesalemiya to Asrasement Mazoriya. According to the new structural plan, the study area has 30 m Boulevard Street and partial expressway and 20m collector streets.

The street from Mesalemiya to Sefere Selam is 0.55 km long with a category of SAS of 30 m width; from Sefere Selam to Kolfe 18 Bridge the length is 0.621 km with a category of CS 30 m width, from Kolfe 18 Bridge to 18 Square, the length is is 0.55 km with a category of CS of 20 m and from 18 Square to Lekuwanda the length is 1.27Km with a category of PAS 40 m as per the city's Master Plan. The total length of the study area is around 3 km with different widths of carriageways. The road segment includes the Mesalemiya Bridge which is located around 1.4 km from Mesalemiya. Kolfe-Asrasement Mazoriya intersection is end point at the Ring Road, a highly congested roundabout which requires an immediate improvement. The traffic volume and type of vehicles using the intersection includes loaded and unloaded trucks, truck trailers, and different sizes of public transport buses, shared minibuses taxis, private vehicles and pedestrians. The traffic using the intersection has local nature with need of accessibility to the immediate surroundings of the intersection as well as long distance travelers in need of high speed mobility. Figure 29 below shows some pictorial view of the research area.

Figure 25 Proposed Road Network of the Study area

Figure 26.Pictorial view of Pedestrian mobility at some part of the research area

Table 19: Street Feature of the Study Area

Length in Km	Existing Land use at left and right of the right of way	Proposed Land use	Chain age	Topography	Road Feature	Existing Width of Right	Number of lane	Pedestrian Walk way	Existing Road Hierarchy Standard	Pavement Details		Street Furniture			Drainage		AADT 2015	
										Type	Condition	Street Light	Road	Traffic	Type	Length	Pedestrian	Vehicle/hr
0.544	residential and commercial Public and semi-public schools, offices,		0+000-0+560	Flat	SAS 30m	7	2	No	No	AC	Fair	No	No	No	No			
0.621			0+560-1+120	Rolling	CS 30m	8	2	No	No	AC	Fair	No	No	No	Pipe		400	1773
0.55			1+120-1+680	Flat	CS 20m	7	2	No	No	AC	Fair	No	No	No	Pipe			
1.27			1+680-2+960	Rolling	PAS 40m	14	4	Yes	Yes	AC	Very good	Yes	No	No	Pipe			

(Source: Data obtained by researcher)

4.8 Design Speed

The design speed is a tool used to determine geometric features of a new road during road design. Contrary to the word's implication, a road's design speed is not necessarily its maximum safe speed but can be higher or lower. The design speed chosen for a highway is a major factor in choosing super elevation rates and radii of curves, sight distance and the lengths of crest and sag vertical curves. Roads with higher travel speeds require sweeping curves, steeper curve banking, longer sight distances, and gentler hill crests and valleys. Lower speed roads can have sharper curves, less banking, less sight distance, and sharper hill crests and valleys.

(ERA, Ethiopian Roads Authority Manual, 2013)includes design speeds. When a new road is under design the speed should be considered. Every geometric feature of roads in Ethiopia has the criteria on speed selection. The design speeds of urban roads in Ethiopia had stated design speed of Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda street segment could contribute congestion of the traffic with low operating speed, lower than the design speed of the urban road which is 50 km/h.

4.9 Lane Width

The adopted criteria describe design values for through travel lanes, auxiliary lanes, and turning roadways. There are also recommended widths for special-purpose lanes such as continuous two-way left-turn lanes. AASHTO also provides guidance for widening lanes through horizontal curves to provide for the off-tracking requirements of large trucks.

Minimum number of lanes: At least two lanes in each direction, and more if necessary for an acceptable level of service in the design year, according to the current edition of AASHTO's "A Policy on Geometric Design of Highways and Streets". Table 19: Below shows the geometric design of highways and street policy.

Table 20: Standard on Geometric Design of Highways and Streets

Ranges for Lane Width	
Type of Roadway	**Metric (meters)**
Principal Arterial Street	3.6
Ramps (1-lane)	3.6-9.2
Arterial	3.3-3.6
Collector	3.0-3.6
Local	2.7-3.6

(Source: AASHTO, 2008)

The manual of AACRA (November, 2004) dictates that a feature of a highway having great influence on safety and comfort is the width of the carriageway. Then, lane widths of minimum 3.5 m are used for road classes Freeway and Arterial also for sub-arterial and collector streets. The extra cost of 3.65 m above that of 3.0 m is offset to some extent by a reduction in costs of shoulder maintenance and a reduction in surface maintenance due to lessened wheel concentrations at the pavement edges. The wider 3.5m lane also provides desired clearances between large commercial vehicles on two-way (2-lane) highways. 3m lanes are appropriate on collector roads. Standards for carriageway widths are shown in Table 20 below for all Road Design Standards of the AACRA manuals of November 2004.

Table 21: Geometric Design Manual for AACRA

Geometric Design Summary Table

Criteria	Road Class				
	Freeway	Arterial	Sub-Arterial	Collector	Local
Traffic Parameters					
Pedestrian Facilities	Nil	Both sides	Both sides	Both sides	One side or shared zone
Parking	Nil	Nil	Limited	Limited	Full
Property Access Control	Full	Full	Limited	Limited	Nil
Speed Parameters					
Speed Limit (km/h)	80–100	70	60	60	50
Car Design Speed (km/h)	90–110	80	70	60	50
Truck Design Speed (km/h)	80–100	70	60	52	43
Cross Section					
Carriageway	Dual	Dual	Single / Dual	Single	Single
Reserve Width (m)	50–75	30–60	25–40	20–30	15
Formation Width (min) (m)	50	30	25	20	15
Pavement Width (min) (m)	2 x 10	2 x 10	10	9	6
Lane Width (m)	3.5 (min)	3.5 (min)	3.5	3.5	3
Shoulder Width (m)	1–2	1–2	1–2	1	1
Stopping Sight Distance[4]					
SSD Cars (min) (m)	140–205	114	91	71	54
SSD Trucks (min) (m)	143–210	116	91	69	50
Alignment					
Horizontal Radius (min) (m)	3000	1250	295	200	130
Crest K value (min)	46–98	31	20	12	7
Sag K value (min)[2]	32–33	29	18	12	9
Grade (max) (%)[3]	5	6	7	8	12

(Source: - AACRA Geometric Design Manual, November, 2004)

Subsequently, the length of the street is about 1.27 km from Lekuwanda-Aserasement PAS 30m roundabout Kolfe-Aserasement roundabout to the Mesalemiya Bridge which is 10 m in width and had two-way two-lane carriageways, except the Kolfe-Aserasement roundabout to Lekuwanda. Table 19 below shows the Mesalemiya-Kolfe-Aserasement-Lekuwanda Street.

Table 22: Lane width of Mesalemiya-Kolfe-AserasementMazoriya-Lekuwandastreet segment

Location	Master plan Standard	Existing Range of Lane Width	
		carriage width	Lane width
		meters	meters
Mesalemiya- Sefere selam	SAS	7	3.3
Sefere selam-Kolfe/Aserasement Bridge/	SAS	6.7	3.2
Kolfe /Aserasement Bridge/-Aserasement Square	SAS	6.7	3.2
Aserasement Square-Lekuwanda	PAS	14	3.3

Source: Researcher

4.10 The Effect of Lane Width on Traffic Operation

Lane width has an effect on traffic operations and highway capacity, particularly for high-speed roadways. The interaction of lane width with other geometric elements, primarily shoulder width, also affects operations.

When determining highway capacity, adjustments are made to reflect the effect of lane width on free-flow speeds. Lane widths of less than 3.6 meters reduce travel speeds on high-speed lesser desirable clearances between large commercial vehicles travelling in opposite direction two lane particularly high percentage of commercial or freight vehicles; Tables 20 shows Summarized and shows operational effects of street lane widths.

Table 23: Operational Effects of street Lane Width

Operational Effects of Street Lane Widths	
Lane width (m)	**Reduction in Free-Flow Speed (km/h)**
3.6	0
3.5	1
3.4	2.1
3.3	3.1
3.2	5.6
3.1	8.1
3	10.6

(Source: Highway Capacity Manual, 2008)

As we had made measurement on the Mesalemiya-Sefere-selam, Sefere-selam-Kolfe Asrasement Bridge, Asrasement Bridge–Aserasement Square and Aserasement Square-Lekuwanda street

section, the width of the lane ranges from 3 m to 3.3 m respectively. Based on the counted data by the Consultant, UNICON in 2015, the AADT of the Mesalemiya-Lekuwanda street section varies around 6,892 near Kolfe Roundabout about 3,566 at Kolfe Bridge. The AADT were composed of 28 % private vehicles, 47 % mini/midi buses, 2% large Buses and 23 % Small trucks/trucks/trailers on both directions

As per (AACRA, November,2004), for design of traffic flow 5,000-10,000 per day or more than 417 vehicles per hour. The CS road standard is recommended with a 3.5m wide lane. But actually, it was observed that the specific street segment lane width is 3.0 m to 3.3 m which lie below the standard. However, the traffic volume of this street segment narrowness of lane width, the traffic operation on this route is adversely affected, decreasing significantly causing congestion as shown in Table 20 above. Table 21 below shows the traffic percentage share of different size of vehicles of the research area.

Table 24: AADT of the research area

S.No.	Type of Vehicle	AADT %
1	Small Vehicle	28
2	Mini/Midi buses/	47
3	Large Buses	2
4	Trucks and Truck Trailers	23
		100

(Source: By UNICONE 2015, AACRA Design Office)

4.11 The Effect of Lane Width on Travel Time

At free flow speed or at the design speed, the length of 3 km on the Mesalemiya-Kolfe-Aserasement-Mazoria-Lekuwanda street segment takes 3.0 minutes as per AACRA Manual, 2004 indicates. It is indicated in the Manual that an urban vehicle speed is 60 km/h. However now, as it was recorded by the enumerators during the seven days survey and also as it observed, mini bus/shared/ taxi, Higer, Public bus the average travel time along this segment took 17:07:01 minutes which made a difference of 13:31:01 minutes of the free flow speed. From this analysis, it was understood that the Mesalemiya-Kolfe-AserasementMazoriya-Lekuwanda street segment was congested with significant delays also manifested by the high passenger crowded boarding and long queuing as shown in figure 30 below and Table 22 below shows the travel time on Mesalemiya-Kolfe-Aserasement-Mazoria-Lekuwanda street segment by different modalities.

Figure 27.Overcrowded City Bus and long queue at mini bus, Asrasement mazoriya and Lekuwanda (Source: Researcher)

Table 25: Travel time of Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda road segment by different modalities

Operation Time							Design
No.	**Route**		**Distance in Km**	**Free flow Travel time**	**Mode**	**Total(min)**	**Speed(km/h)**
	From	To	1(60)				
1	Mesalemiya	Lekuwanda	3	3.0	Mini bus/Shared taxi/	16:57:34	11.3
2	Mesalemiya	Lekuwanda	3	3.0	Public bus	20:22:16	9
3	Lekuwanda	Mesalemiya	3	3.0	Higer bus	18:47:10	10
4	Lekuwanda	Mesalemiya	3	3.0	Private Veh.	12:24:53	15
Mean minutes						**17:07:01**	

4.6 Shoulder

A shoulder often serves as an emergency stopping lane and is reserved for that purpose. Many wider roads in the United States have shoulders on both sides of each directional carriageway, in the median as well as at the outer edges of the road, for additional safety. Typically the shoulder is not for use by moving traffic.

As stipulated in the AACRA Manual of 2004, in shoulder is the part of the roadway adjacent to the carriageway for the accommodation of stopped vehicles; traditional and intermediate non-motorized traffic, animals, and pedestrians; emergency use; the recovery of errant vehicles; and lateral support of the pavement courses. Shoulder widths versus design standards, terrain type, and urban/rural environment are presented in Table 20 of (AACRA manual, 2004). They vary from no shoulder on minor rural roads where there is no surfacing to 1.5-3.0 m or even greater sealed shoulder on major roads depending on the terrain and design classification.

Shoulder width: Minimum outside paved shoulder width of 3.0 m and inside shoulder width of 1.2 m. With three or more lanes in each direction, the inside paved shoulder should be at least 3.0 m wide.

The vehicular movement on the segment of the Aserasement-Mazoriya-Lekuwanda road need certain parking area or shoulder as part of the roadway adjacent to the carriageway for the accommodation of stopped vehicles; traditional and intermediate non-motorized traffic, animals, and pedestrians; emergency use; the recovery of errant vehicles; and lateral support of the pavement courses. But, as observed, the parking section of the above road segment was not providing the proper function for parking of vehicles because it was completely deteriorated. When the drivers want to park, they simply use certain section of the carriageway as a park making pedestrians off their walking sideways. This situation makes to stop the vehicles following and made the route certainly congested.

4.13 Drainage

Drainage is a key element in the life of pavement systems. Elimination of this element will assuredly lead to the premature failure of pavement systems, thereby resulting in high life-cycle costs. Faulting and associated pumping in rigid pavements systems, extensive cracking from loss of sub grade support in flexible pavements, and distress from frost heave are clear signs of inadequate drainage. Proper drainage cannot be overstressed in road construction. Water affects the entire serviceability of a road.

The drainage of the Mesalemiya-Kolfe/Asrasement Bridge/-Aserasement-Mazoria-Lekuwanda street segment had distracted the character of the pavement by losing proper draining from crown of the road to the shoulder and to the ditch. The cross falls of the pavement loss uniformity to drain the rain water properly and superimpose over the pavement. Then, the poor drainage of the route makes the pavement deterioration and creates obstruction to moving vehicles at free flow speed. This results in traffic congestion on this road segment.

4.14 Pavement Deterioration

Highway pavements, once constructed, will not last forever. After a time, signs of wear will appear. These signs include cracking, cutting and polishing of the road's surface. A point will arrive where the wear and tear is at such an advanced stage that the integrity of the pavement and hence the normal service provision will be reduced. Maintenance is required at this point to prolong the highway's useful life. Loss of skidding resistance and texture are forms of deterioration eventually suffered by all highway pavements

As observed, most parts the pavements of the Mesalemiya-Kolfe-Aserasement-Mazoria-Lekuwanda street segment; it had been deteriorated, especially from Mesalemiya to Aserasement Mazoriya. Deteriorations of this pavement is characterized by pothole, cracking, and loss texture and skidding resistance, so, the drivers had to reduce the speed flows due the deterioration of the pavement causing traffic congestion. Figure 29 below shows pavement deterioration around the area.

Figure 28.Pavement deterioration around the research area

Source: Reseaercher

4.15 Existing Urban Public Transportation Supply

Mobility rate in the street section, like many cities in developing countries, is low and yet on the increase. In the industrialized countries, a daily trip per person is on the average 2.5. However in most developing countries, the corresponding value is around one daily trip per person (Gil 1989).The figure for the Addis Ababa in 2004 was 1.08; for Cairo in 2001 was 1.41; for Tunis in 2000 was 2.0 and for Abidjan in 2001 was 0.86, as provided by the National Transport Master Plan of Ethiopia, 2008

Another study report on the improvement of urban public transportation for the period 2005-2010 estimated the total travel demand for the city to reach 4.3 million trips /day in the year 2005 assuming the population of the city to be 3.7 million. In 2020, with mobility rate increasing to 1.3trips/person/day and an estimated population of 5.6 million, the daily travel demand for the city would reach 7.7 million person trips (National Transport Master Plan Study, 2008)

The daily distance covered per operational bus is 156Km in 2004 and currently about 145Km.This is mainly due to low operational speed of the buses for they usually operate in mixed and congested traffic. The standard is 230-260Km (Addis Ababa City Atlas, first edition, 2015)

Moreover, informality in housing construction, business activities and service provision is being a common phenomenon for the specific research area as well as Addis Ababa. These increasing informalities in all aspects of development have come to be the major constraint in providing safe, efficient and equitable public transportation services in the specific area. If informal construction would have been 'unplanned', as used in most literatures, nearly 80% of the total housing units built between1984 and 1994 would be informal (ORAAMP, 1999). UN-HABITAT (2007) study shows that the A.A.C.A. issues not more than 500 residential building permits, while the actual building in the city exceeds 4000 residential housing units annually. But in this research, 'informal settlement' is referred as a construction taken place on a publicly owned land without the authorization of the A.A.C.A. However, even with this definition, the housing units provided by the formal sector do not exceed 30% of the total housing unit in that period the rest being either semi-formal or informal, according to CSA (2013).Currently, among the 655,118 conventional households and 7,610 unconventional households living in the city, it is estimated that 1.14% of them do not have housing units at all but live in shacks or on the streets. Among these Kolfe Keranio Weredas 10, 11 and 12 and Addis Ketema Wereda 04, 08, 09 and 10 49,001 households of the research area,

The interviewees argues that, though informality in a way responds to the acute housing demand, it also has negative impacts like hazardous settlements, inefficient utilization of land and public infrastructure, difficulty of infrastructure provision, and environmental problems in addition to poor economic performance. While the interview, it was also said that the informal settlement of houses in different places of the area and claim for infrastructure services has made vertical and horizontal coordination of land use and public transport planning between sector agencies arduous given the poor institutional arrangement and capacity.

This alarmingly growing informality in all activities in the city is also mentioned by one of the interviewee as a major threat to the future development of the city. He said, the situation is getting sever in spaces deliberately left open for public purposes, green areas and environmental value by the master plan between the newly developed areas at the periphery and the inner city. The informal activities in the city have gone far to a level of encroaching waste disposal sites, river gorges, green strips, important agricultural lands, and backstreets. The respondent reassures that this trend of development is not only wasteful but also has adverse effects on the economic, social and ecological pillars of development. Currently, a study by ORAAMP (1999) shows that larger number of residential housing units in Addis Ababa is produced by the informal sector. The authorities admit that the appropriate explanation of the driving force behind this could be a swift market response to the ever growing demand for cheap housing and rental accommodations. However, this has resulted in a mismatch between the city plan and the actual situation, hence made service delivery a morass. Nevertheless, this is not an easy matter to halt overnight in a city where

79% of the population is categorized as the poorest of the poor and 90% in general is considered as very poor (ORAAMP, 1999). Moreover, unemployment has shown a sharp increase in the city, the number rose from 10.5 in 1984 to 34.7 in 1994 and currently reached 42% (UNCHS, 2000).

Another form of informality observed in area at large numbers is changing the land use of an area by alteration or extension of the formal housing without the knowledge of the planning authority. The respondents agreed that dynamic land use changes are observed in different parts of the research area depending on the degree of accessibility of an area, access to utilities and municipality services, and its compatibility to the present use. Moreover, the replies made clear that, although this is a healthy process that shows the dynamicity of a the area also the city, it is not possible at all to tolerate unplanned changes this far since it results in a quagmire in mobility, and an immense pressure on public infrastructure and the environment. This process changes the travel behavior of people in that area as explained by the land use and public transportation supply interaction model of Meyer and Miller (1984). In these cases, measures on land use and transport policy organization will not have considerable impact since most of the urban form in being developed out of the control of the master plan.

What makes this worth is that, most of the land use changes in the research area occur along major streets and on residential plots. These changes, though sometimes show positive results, usually are inefficient as they are not planned. According to the responses, the problems that are associated with unplanned land use changes can be mentioned as misuse of public spaces reserved for health, education and civic centers for individual purposes, inhabitable, unsafe and inconvenient built environment (examples are sound, water, soil and air pollution), and land use imbalance along Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda street segment.

Among all, land use imbalance is observed at large numbers in all of the two areas under this research. While changing the function of a unit without considering alternatives creates inconvenience, increased cost of transportation, longer trip and, hence, increased travel demands (Mayer and Miller, 1984). It was also observed that a number of street vendors blocking mobility of peoples, which is a common epidemic in nearly all locations of the research area that plays a major role in aggravating the congestion, pollution and traffic accidents, and result in long commuting time and trip delays.

The interviewee unanimously agreed that mobility lies on top of the major problems of the areas under study that will get even worth in the future. This is so because most of the developments are located very far from the inner city where most of the activities are located and widely dispersed that the Government is short handed to provide infrastructure to meet the travel demands. This is shown by the high level of congestion and pollution that has resulted from the insufficient provision

of right of way due to many reasons and road networks of all the areas under study. Another fact to bear in mind is that 35 percent of the residential settlements in Addis Ababa are not accessible by small vehicle. In addition, it is indicated that the older residential settlements in the city are better served with street infrastructure than the newly developed areas in the outskirts (UN-HABITAT, 2007). This, according to the respondents, is an earnest matter that solicits resolute action to sustain the development of the research area as well as the city where work requires substantial trips.

Table 26: Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda Anbessa City Bus Routes

No	Anbessa Origin-Destination	Route No	Distance in Km	Tariff in Eth. Birr		No of Buses Assigned	
				Fixed	Flexible	Rigid	Articulated
1	Merkato Autobus Tera- Mesalemia, 18 Kolfie Adebabay, Likuanda- Fil Doro	21	8.6	-	1.50 and 1.00 at 18 Square	3	2
2	Merkato Autobus Tera- Mesalemia, 18 Adebabay, Filipos Church-Lomi Meda	69	5.9	-	2.00 and 1.00 at Ketena hulet	3	3
3	Lagehare-Commerce, Mexico, Tor Hailoch, Ring Road - Wingate	73	10.2	-	2.00 and 1.00 at Coca Cola, Manuel	3	
4	Merkato Autobus Tera- Mesalemia, 18 Mazoria, Lukanda, File Doro, Menagesha - Holeta	85	45	-	2.00 and 1.00 at Ketena hulet	3	3
5	Addis Ketema-18square-Menagesha-Holeta -Addis alem	95	47	-	2.00 and 1.00 at 6 Kilo -Ketena hulet,Lebu,Mebrat Haeil-Bole Michael		6
6	Merkato-18 Square-Filidoro-Tatek Gebeya	118	18	-	1.50,1.00 at 18 Square	1	1

Source: ACBE planning office, 2016

Table 27: Shared taxi routes to Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda

S. No	Origin-Destination	Distance in Km	Tariff	Public Transport Type	Mini buses in different associations				Midi bus
1	Yeshidebele-Torehailoch-Asrasement NOC	6.8	3.6	Code 1	6	12	7	6	19
2	Asrasement NOC - Autobus tera-Piassa Shewa Dabo	4.2	2.5	Code 1	5	16	7		
				Code 3	2				5
3	Lekuwanda-Autobus tera-Piassa Shewa Dabo	4.7	2.5	Code 3	10	12	10	14	
4	Asrasement NOC-Torehailoch-Stadium-Hayahulet chafe	10.9	4.2						
					107				**24**

(Source: Addis Ababa Road and Transport Bureau, public transport and traffic management, 2016)

4.16 Delayed Due to Congestion

Regarding this subject, it was found that the 55% of the respondent waited for more than 30 minutes, 25% of the respondents waited 20 to 30 minutes, 15% waited for 10 minutes and 5% of the respondents waited for 5 minutes. Based on this data more than half of the peoples are late by over 30 minutes.Table 26 below shows delays resulted because of congestion.

Table 28: Delay resulted by congestion vs. responses

Delay in Minutes	Responses	Percentage
5	14	5
10	42	15
20 to 30	70	25
>30	152	55

In addition to assess the economic impact of the selected route, travel time data that indicate free flow and during congestion hour were gathered for seven days on different vehicles of taxis, buses, and private vehicles. To know the time it takes, to travel from and to the starting point and end of the selected route, a stop watch was used. The summary of the data is included in the annex while the average time and the formula are described as follows. As it was mentioned earlier in the literature review, there are different methods to measure congestion and one of these is the average congestion delay compared with free flow traffic.

Moreover, most respondents held their commercial activities at the edge of the main street aggravating the congestion and pollution problems of the Mesalemiya-Kolfe-Aserasement-Mazoria-Lekuwanda street segment and the surroundings by encroaching the path way and blocking mobility of freight, pedestrians and vehicles; especially at evening pick hours. The problems in these areas, can be mentioned as lack of off-street parking and/or pedestrian walk ways, inability to enforce land use policies, and no separated inappropriate location of bus and taxi boarding and alighting stations. Studies (Melese, 2005, Transport Research Laboratory, 2002) on not having on-boarding and alighting urban public transportation users support this observation by giving an exact length without side-walks to be 1.27 km which means that out of the nearly 3.0 km of asphalt concrete street, more than half does not have standard pedestrian walk way, at all. Therefore, this shows that the transport planning and street infrastructure provision gave more attention to the comfort of the motorized transport and hardly looked at the pedestrians and their safety which is a blunder in a research area where walking surpasses the urban trips.

Moreover, shared-taxis are demand-responsive and prefer only few destinations in that area because people are willing to pay higher transportation fares, unfairly set by the service providers since users value the trip to and from the inner city and market centers for different activities most. It is this 'consumer surplus' that serves as pull factor for these poorly regulated shared taxi service providers to prefer these specific areas over the others according to the respondents.

The actual situation is even worse than what is expected because of poor planning and faulty designs and policies. In general, it can be said that the land use allocation in specific area is beyond control of policies. Inability to control illegal and/or informal activities made traffic congestion, pollution, and accidents beyond one can ever imagine by looking only at the weak policies and those not implemented.

The Federal Transport Authority statistics validates this statement with Ethiopia having the highest traffic accidents in the world, Addis Ababa taking 60% of the share (Asfaw, 2000). UN-HABITAT (2007) study asserted that traffic accidents involving fatality and major injuries rose from 3.6 percent per annum in 1998 to 6.3 percent in 2003 being among the highest in the world in relation to the number of vehicles and distance coverage's. As a result, the economic advantage of the city and being the seat of international organizations, including AU and ECA, it is in jeopardy regarding traffic accidents which is very sad. Table 27 below presents the average travel time during the week under different vehicles, as observed during the study.

Table 29: Average travel time of the week with different modes of transportation

Modes	Av. travel time on Monday		Av. travel time on Tuesday		Av. travel time on Wednesday		Av. travel time on Thursday	
	Morning/L-M/	Evening /M-L/	Morning/ L-M/	Evening /M-L/	Morning/ L-M/	Evening /M-L/	Morning/ M-L/	Evening/ L-M/
Bus	29:38:15	28:20:21	19:17:01	23:38:01	22:43:10	25:55:38	21:13:37	22:32:03
Mini bus	25:55:01	22:17:46	22:17:46	22:26:24	21:14:23	21:10:00	17:19:05	17:48:08
Midi bus	26:59:41	26:07:52	26:07:52	19:06:55	21:42:01	23:20:14	19:56:20	19:29:05
Private Veh.	13:38:03	23:13:53	23:13:53	13:21:33	13:32:37	13:32:37	12:26:39	12:16:57
Modes	Av. travel time on Friday		Av. travel time on Saturday		Av. travel time on Sunday			
	Morning/M-L/	Evening/L-M/	Morning/ M-L/	Evening/ L-M/	Morning/ M-L/	Evening/ L-M/		
Bus	25:57:40	21:31:13	1:22:42	27:21:36	15:48:19	16:36:48		
Mini bus	20:17:50	17:49:32	20:29:32	22:09:46	11:00:41	12:48:49		
Midi bus	24:22:09	20:21:36	22:06:55	24:32:19	13:04:27	15:30:50		
Private Veh.	12:03:50	15:08:26	16:08:40	20:24:09	6:36:15	9:08:55		

As observed in Table 27 above, Thursday and Sunday can be considered as the day with relatively better free flow traffic. Therefore, we can consider them as references for the calculation of delays. First, it is required to know the average travel time during each day then the deviation of travel time during the congested time under the free flow can be calculated. Finally, the average delay caused by congestion for different vehicles can be calculated as depicted in table 28 below.

Table 30: Average delay caused by congestion for different modes of transportation

Modes	**Free flow travel time**	**Average Travel time at congested**		**Average Delay caused by congestion**	
		Morning	Evening	Morning	Evening
Bus	6:00:01	22:51:32	23:42:14	16:51:31	17:42:13
Shared Taxi	3:36:00	19:47:45	19:30:04	16:11:45	13:30:03
Higer bus	5:14:28	22:02:46	21:12:42	16:48:18	15:12:41
Private Veh.	3:10:26	13:57:08	15:18:04	10:46:42	9:18:03

4.17 Average Congestion Delay Compared with Free-Flowing Traffic

This section helps to compare the delays in time due to congestion as compared with free flow or normal condition. This mechanism was used to assess the negative impact of congestion on the selected route.

4.18 Impacts of Congestion

The impact of congestion is quite obvious: it affects the social life, economy, environment and health of mankind and animals. Some of the negative impacts on human community will be discussed as follows:

4.18.1. Social Impact

Congestion cause delays which may result in late arrival for employment, meeting, appointment, education resulting in interrupting a normal social and economic process. It affects the interaction of people in different ways. For instance, a person spending long time on a road might not have sufficient time to spend with his/her family, or cannot visit families.

Non-recurrent congestion also creates inability to forecast the travel time and arrival time accurately, therefore causing undesirable (late) arrival time.

Blocked traffic also interferes with the passage of emergency vehicles traveling to their destinations where they are urgently needed. Death might happen to a patient travelling by emergency vehicles or other mode of transportation due to delays caused by congestion.

Road rage is also caused by congestion, which is aggressive changing the behavior of a driver such as rude gestures, verbal insults, deliberately driving in unsafe or threatening manner. Road rage can lead to altercation, assaults, and collisions which result in injuries and even deaths. It can be thought of as an extreme case of aggressive driving.

During the study, it was tried to assess the problem on the study route through questionnaires accounting for 276 road users for about 7 days. The question and the results are as summarized below.

How often one uses the route: the responses showed that 67.7 % of the respondents use the street for 5 to 7 days of a week, 18.47% for 3 to 4 days of a week and 13.83 % for 1 to 2 days. The results are presented in Table 31 and Figure 32.

Table 31: Summary of responses on week day

Week days	Responses
5 to 7	187
3to 4	51
1to 2	38

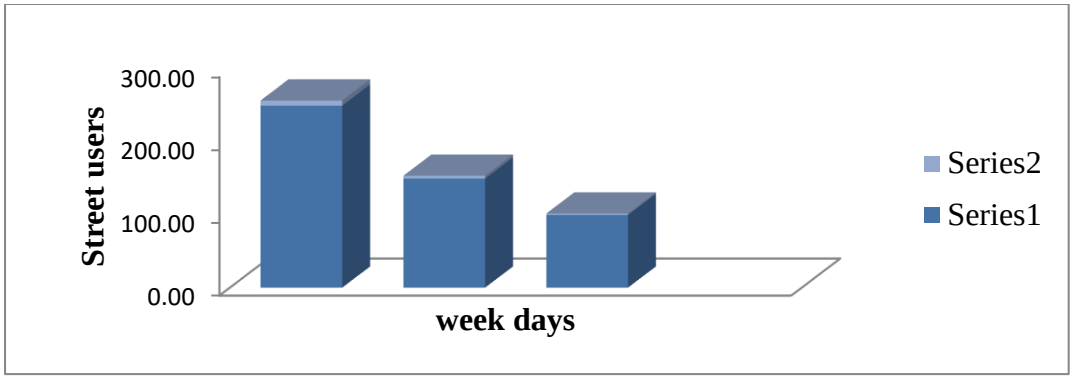

Figure 29.Graphic representation of road users vs. week days

Trip purpose: 38.8 % of the respondents travel for academic purpose, 48.92% of them travel to work and the remaining 12.28 % travel for different purpose. From this one can see the road is dominated by travelers to generate money. Therefore every activity in this road directly or indirectly affects the income of these travelers which also had a great impact on the overall socio economic values of a country.

Table 32: Trip Purpose

Purpose	Responses
Academic	106
work	136
others	34

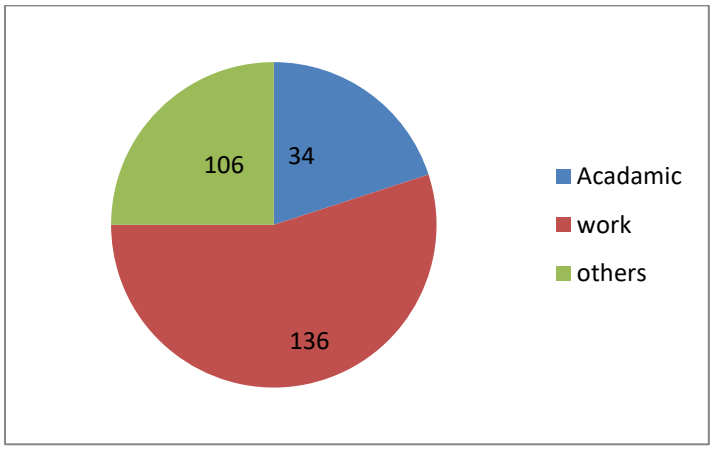

Figure 30.Graphical representation of trip purpose

4.18.2. Social crises resulted by congestion

Here, 43.5% of the responses indicated late arrival to work, 9.7 % show that they miss important appointment, 7.6% indicates they miss to attend spiritual practices like “Selat” and “Kidase”, 3.3 % indicate late arrival to school, 6.8 % responses show that they miss social interactions like visiting cousins and unfortunately, 29.1% were not willing to respond. Table 30 below shows the social crises attributes and lost values due to vehicle congestion and Figure 33 graphically represents the same.

Table 33: Social crises resulted by congestion

Social crises	Number of Responses	%
Miss important appointments	27	9.7
Miss spiritual practices like "selat" and “Kidase”	21	7.6
Miss social interactions like visiting cousins	19	6.8
Late arrival to job	121	43.5
Late arrival to school	9	3.2
No response	79	29.1
Total	276	100.0

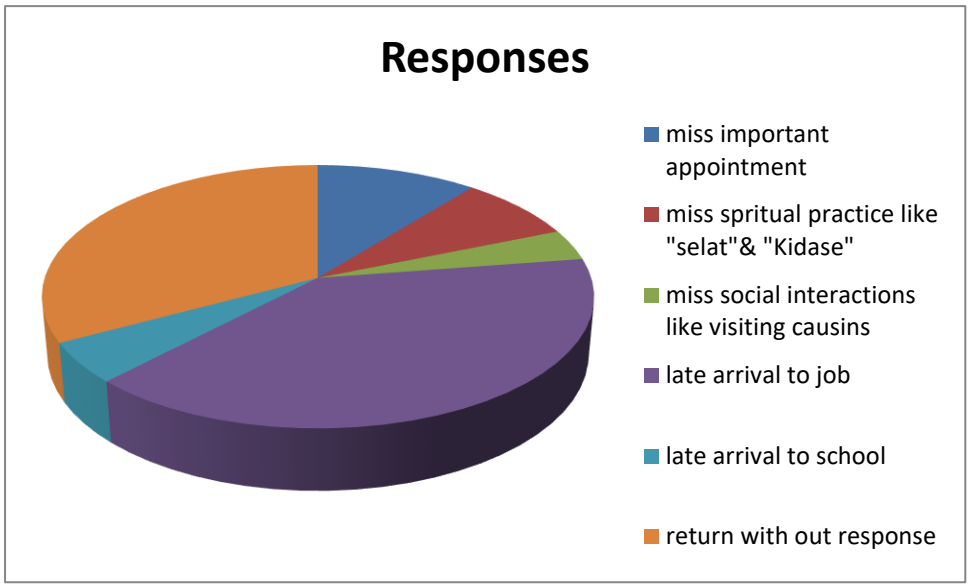

Figure 31.Graphic representation of Social crises

4.18.3 Economic Impact

Congestion affects the economy of a country in different ways. Some of these are:

- Higher chance of collision due to bumper to bumper traffic movement of vehicles;
- Wasting time of motorists and passengers i.e. non-productive activity for most people, congestion reduces regional economic health;
- Negative impact on the delivery of goods and services;
- Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements; and
- Strained and congested roads consume more fuel; increased fuel use may also in theory cause a rise in fuel costs.

From the questionnaire we have the following summary of data related to delay:-

As a result, people using this route are delayed and are expected to cost a delay by their hourly value of time.

(Congested flow time –free flow time)* R

When R= value of time

Example:- If a person earns Birr 200/hour and works for 8 hours per day the total loss will be as follows:-

- **Using Bus**: delay for one day = 16:51:31 and for six days = 106:13:19
  - ✓ Total loss per week, 200*106:13:19 = Birr 354/person
  - ✓ Birr 1,413.32 per month and Birr 16,959.84 per year.

- **Using Shared Taxi:** Delay for one day 16:11:45 and for six days 81:00:16
  - ✓ Total loss per week, 200*81:00:16 = Birr 249.23 /person
  - ✓ Birr 1080/ month and Birr 12,960/year
- **Using Higer bus:** Delay for one day 16:48:18 and for six days 91:16:03
  - ✓ Total loss per week, 200*91:16:03= Birr 304.00/person; and
  - ✓ Birr 1,213.33/month and Birr 14,560/person

- **Using private car:** Delay for one day 10:46:42 and for six days 55:48:19
  - ✓ Total loss per week 200*55:48:19 = Birr 184.00/person
  - ✓ Birr 736/ month and Birr 8,832.00/person

From this example one can see how much we are losing due to congestion.

4.8.4 Extra Time Spend if the Commutes were reduced

Here 52% of the responses show that the respondents will spent their time with families and friends, , 13.6 % show that they part take in recreation, 11 % indicates they will participate in exercise, 20 % respond that they would sleep more and 3.4 % will work additional hours. From this data we can also conclude that congestion is affecting our social interaction to large extent.

Table 34: Extra time spending activities it the commute is reduced

Activities	**Percentage**
spend with families and friends	52
partake in recreation	13.6
would exercise	11
would sleep more	20
would work more	3.4

4.19 Findings

The following are findings of the research:

i. Existing Land use is disproportional to the proposed Structural Plan;
ii. Significant delay of Urban Public transportation services;
iii. Speed reduced due the narrower of lane width./bottle-necked starting from Mesalemiya-Asrasement Mazoriya a total distance of 1.7 km;
iv. No off-street and basement parking spaces;
v. Vehicles use the road shoulder as carriageway;
vi. Poor drainage facility makes deterioration of the pavement by superimposing the carriage way;
vii. Pavement deterioration reduces speed of the vehicles;
viii. Existing land uses cause the traffic congestion on this route;
ix. The Mesalemiya -Kolfe-Asrasement Mazoriya road end at the intersection with the Ring Road at a highly congested roundabout;
x. The traffic volume on the study road lane is greater than the capacity; and
xi. No existing elements of street side furniture's.

4.20 SWOT Analysis of (Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda area land use and transportation supply), Addis Ababa

Specifically, the research is conducted in Weredas: 10, 11 and 12 of Kolfe Keranio and 04, 08.09,10 of Addis Ketema with a general objective of creating better socio-economic and physical environments and better mobility.

Following is a box that shows a SWOT analysis of the situation of the Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Street within the context of integrating land use and urban transportation supply as derived from the empirical part of the research. The strengths and weaknesses in the area and the opportunities and treats of the external environment should be considered for successful integration to result in sustainable development. Box4-38 illustrates SWOT analysis of the current situation regarding the Mesalemiya-Kolfe-Aserasement Mazoriya-Lekuwanda Street.

Table 35: SWOT Analysis of the research area

Strength	Weakness
➢ Good topography (moderate type of slope for development). ➢ Existence of Efoyta,Amanuel ehil berenda and nearby Merkato markets ➢ Center for the city's economic activities	➢ Problem of Sanitation and sewerage system ➢ Access problem ➢ Policy gaps ➢ Poor urban public transportation supply

➢ Large population	➢ Focus on motorized transportation ➢ High demand for housing ➢ Poor law enforcement ➢ High level of informality ➢ Poor documentation
Opportunity	**Threats**
➢ Good governmental structure ➢ The action area bounded by different potential streets ➢ Existing community participation, support and financing schemes. ➢ Investors interest	➢ Weak mobility, highly traffic congested street ➢ Lack of institutional arrangement for facilitating the implementation of the street design standards. ➢ Shortage of experience in street design implementation and standardization. ➢ Shortage of financial and manpower resources. ➢ Challenges of integration of streets and utilities due to varying mandates and responsibilities of organizations.

Chapter 5 : Conclusions and Recommendations

5.1 Conclusions

The aim of the empirical part of this research is to analyze the need for integrating land use and public transportation policies in Addis Ababa for sustainable development and evaluate the opportunities and barriers to do so. An integrated land use and transportation approach yields considerable opportunities and benefits to communities attracting investment and development to an area. The information on land development also benefits transportation planners to better predict the future transportation demands of an area and prepare for the land use allocation impacts on public transportation. Therefore in theory, integrating land use and transportation policies leads to an efficient and environmentally friendly urban transportation system that provides safe, affordable and efficient transportation services, increase energy efficiency, support vibrant economy, reduce pollution and congestion and concurrently reduce adverse health effects. The process promotes sustainable development that affirms equity among societies, dynamic economic activities, and development in harmony with the ecosystem.

The integration helps the poverty reduction process in all aspects while stimulating economic development and social inclusion by creating different opportunities for the people, empowering the poor and enhancing safety/security. Integrating policies in general promotes synergy, reduce duplication of efforts, reduce inconsistency, and maximize the effectiveness of policies and service delivery.

Based on the empirical findings, the study is concluded as follows summarizing the process and outputs of the study.

Organization of land use and urban public transportation supplies:

1. Looking at the way the land use and urban public transportation supplies are organized in the specific area as well as in Addis Ababa, in general, be concluded that the City Administration lacks coordination among responsible stakeholders that hampered the development process. Even if the land use policy and planning, somehow, recognizes the land use-transportation interaction, lack of collaboration with transportation experts, weak institutional capacity and chaotic institutional arrangement have made the land use plans of the city inefficient in ensuring mobility.

2. The Addis Ababa urban public transportation supply is run with proclamations and ad hoc response to transportation supply problems as they happen. This shows that there is no deep studied urban public transportation supplies that project the future travel demands that might

arise from population growth and land use changes of the city. Moreover, there is not even a single land use element in the Transportation Proclamation No.468/2005, which is the most recent plan of action being implemented by the Federal Transport Authority. Besides, the Transport Authority is beyond the jurisdictions of the A.A.C.A.as it is accountable to the Federal Ministry which makes coordination very difficult given the poor institutional arrangement of the authorities.

3. The relation of the A.A.C.A. With the Government of Oromiya Regional State is confronted by potential conflicts on land use allocation. This is a common problem in management of issues that transcend the limits of established policy boundary as a result of poor integration between different tiers of the Government.

4. Although it is characterized by poor documentation, there is an information communication and publications department in the A.A.C.A. which is barely known by the public. Therefore, the public doesn't use the center to find out what is being done in the city, what projects are being implemented, which alternatives are chosen, what changes are expected in land use and urban public transportation supply in the future, etc. after a banal participation at the policy formulation and planning stage.

The impact of the current trend of development on the urban public transportation supply system:

5. Having given emphasis for environmental improvement of the specific area as well as in the city, pushing out industries as far away to the fringes has increased travel demands in the city since urban based workers have to originate a trip and leave their homes to far-flung industries every week days at peak hours.

6. Inconsistency of planning and policy with the metropolitan area together with demand for own housing with spacious plots has also contributed to rapid development of residential houses at the fringes and increasing travel demand to the inner city. As the result of the current trend of development, the journey to work and other activities has substantially exceeded the average walking distance in the city of 5 km; hence, stretched the urban public transportation system to its limits.

Barriers and opportunities for integration of land use and urban public transportation Supply:

7. What is probably the worst barrier for the integration of land use and urban transportation supply in Addis Ababa is that most of the urban activities in the specific research area are dominantly informal. It is becoming common to see informality in housing construction, land

use allocation, business activities, public transportation provision, and informality in parking in the specific areas as well as in the city. In fact, informality in residential settlements will continue to be them in issue of the city and will even expand as it is taken by the citizens as the only solution to combat the housing problems of the city. Besides, the every week data and record handling system of different authorities and institution will also instigate the process.

8. There are also other factors beyond policy and informality that play major roles in land use decisions and changes in spatial structure of Addis Ababa that could be mentioned as barriers. One is market demand; demand for spacious plots, own housing, cheaper plots, quiet and healthy environment, and demand for easy way make money, played crucial role so far.

9. Though in one way, large population and increasing demand for housing could be seen as a barrier that hasten in formality in housing construction, it could also be an opportunity to guide the development of the specific area as well as the city in a transit friendly manner by encouraging dense settlements and taking advantage of economies of scale.

- Finally, to summarize the conclusion in few words, it can be said that the integration of land use and urban public transportation supplies system in the specific area as well as in Addis Ababa is very weak and the effect of the land use plan on urban public transportation supplies in the city is not recognized by the authorities involved in planning and policy formulation. However, since most of the activities in all aspects are dominant.
- Lyled informally, integrating policies between land uses and urban public transportation supply alone seems less effective in sustaining the development process of Addis Ababa. This way, the initial hypothesis is proved to be fully acceptable. There certainly is a need for: Horizontal integration between the different departments of the A.A.C.A. that are involved in land administration and supervision;

- Vertical integration of the authorities involved in land use allocation, urban public transportation supply, and urban street construction with the Federal Transport Authority,

- Inter-territorial integration between the A.A.C.A. and the Government of the Oromiya Regional State that has the upper power in the case of the metropolitan areas.

However, the research revealed that, considering that informality takes the upper hand in urban activities in Addis Ababa, despite the fact that there is a need for integrating policies for sustainable development, the focus on policy alone would be narrow and nugatory.

5.2 Recommendations

This study shows that most of the land use development in Addis Ababa is being done without the consent of the A.A.C.A. Hence, the transportation chaos in the city cannot be solved by concentrating the effort on policy issues alone as that seems a very narrow step; rather it needs a resolute action. However, the role and extent of informality in shaping the spatial structure of the city needs a further study. Having that in mind, the following actions are recommended at three different levels to improve the urban public transportation supplies problems of the city:

5.2.1 Institutional arrangement

Institutional weakness is found to be the major obstacle since the solution to the problem involves the A.A.C.A, the Government of the Oromiya Region and the Federal Authorities. In this regard, the following are recommended:

1. All the sector agencies should reach to a consensus on understanding sustainable development issues in the specific research area as well as in the city. That means effort should be made that economic, social and environmental pillars of sustainable development and how they interact each other are clearly understood. Although this doesn't ascertain policy integration, it at least should lead to commitment and decisive leadership within the authorities that begin from the top but develop throughout the public sector organizations. However, this might not be easy given the potential conflict of interests among sectors, thus requires a strong leadership.

2. It won't be an easy task to integrate land use and urban public transportation supplies since they are controlled by authorities at different levels of government. However, forming an interdepartmental and/or inter-sectoral steering team that facilitates the interaction among sector agencies together with human capacity building on collaborative and integrated policy making and implementation could result in smooth relations, hence synergy.(Stead et al., 2004).

3. Documentation should be improved in A.A.C.A. and data base must be set up to show the amount of the current and future residential settlements to allow the Transport Authority predict the travel demand and provide the necessary infrastructure.

5.2.2 Planning and Strategies

Strategy gap is the major pitfall in the development process of Addis Ababa that has basically resulted from lack of national housing and transportation policies:

1. For a rapidly growing urban population like Addis Ababa, the length and number of daily trips are closely connected with the average population density in built-up areas, and the spatial distribution of trip destinations and origins. Though managing high density settlements

requires large infrastructure investments, the investments are not necessarily higher (in many cases are even lower) than the investment that is required to accommodate an equivalent growth of a low density development at the fringes. Therefore, the strategy should not only encourage but also facilitate a more compact and infill development with mixed use centers that include multiple land uses, high density residential settlements and variety of housing types at some locations rather than allowing a sprawl, as is the case.

2. A comprehensive urban public transportation supply policies that includes strategies of continual upgrading of the urban public transportation supplies network, improvement of urban public transportation supply services, considering social and environmental aspects of public transport, and incorporating land use policies of the city needs to be designed.

3. Plans and zoning codes should contain clear, conveying and readable land use maps that show the land use allocation, density and urban public transportation systems and options of an area. The time horizon of the land use plan implementation should also be indicated as it affects planned transportation projects. Minimum parking requirements, parking terminals both for freight and other vehicles and parking cost should also is part of the Local Development Plan. These are common elements of the land use and urban public transportation supplies but are usually included in neither of them.

4. The urban public transportation supply policy should consider the land use consequences of different mobility option and likewise; the land use policy should take the consequences of land allocation on the transportation system into consideration. Most importantly, while improvements on road construction and upgrading for motor vehicles are shown, almost nothing has been done on non-motorized transportation (NMT) infrastructure. Therefore, emphasis should be given to NMT options as equally as the motorized transport.

5. Promote an urban public transportation supplies policy that supports a more compact urban form and doesn't cause sprawl through high way construction.

4. Clear regulations need to be set to correct and control informal activities in the city that have consequences on urban public transportation supplies and the environment. Moreover, regulations that facilitate control of the private urban public transportation supplies providers should be put in place.

5.2.3 Implementation

1. It is also necessary that a plan achieve internal, horizontal and vertical consistency, not only at the planning stage but also at the implementation stage of policies. Therefore, integration should link the institutional, technical, spatial, and financial elements together.

2. Focus on sequential land development following an incremental extension of transportation and other infrastructure services from near-by built-up areas could facilitate transit provision. Moreover, there should be a balanced mix of urban public transportation modes with a focus on bicycles use and walking.

3. Zoning alone will not guarantee that a particular type of development will occur, rather, policies should consider market forces. In addition, the A.A.C.A. should enforce laws better concerning informal settlements or find a way to formalize them by harmonizing it with the city plan under implementation.

4. Following the extensive construction of street network both in specific area and in the city, it is the view of the researcher as learnt from the case of Durban that, using articulated buses with segregated bus lanes could be a better solution cost-wise and efficiency as well. Moreover, the involvement of the private sector should be developed and encouraged.

5.2.4 Upgrading of the intersection

Upgrading of the intersection to a grade separation is one means of improving the intersection which separates the various conflicts of pedestrian and vehicular traffic flows. Even though, due to the high construction cost may not be preferred for immediate implementation unless there is provision of sufficient budget.

Option one: Ring Road Underpass and Mesalemiya- Kolfe-Aserasement-Mazoriya-Lekuwanda Street at Grade

The ring road to pass under the Mesalemiya Kolfe Aserasement-Mazoriya-Lekuwanda Street requires modification of the Ring Road vertical gradient to be changed from current grade of 6.4% to 7% at the grade separation. The frontage roads of the Ring Road are left at their current level. Its merits and demerits are as follows:

Merits

- The ring road will have relatively gentle grade and good traffic flow;

Demerits

- The foot bridge on the wingate side need to be demolished;.

- The ring road need to be demolished and reconstructed in a stretch of 800m in both sides of the intersection;.
- Due to the profile of the Ring Road, greater length of retaining wall is required which will make the project cost to be higher than option two; and
- Additional ROW will be required for long stretches along the ring road for the slip roads.

Figure 32.Plan for option 1

Option two: Ring Road at grade and Mesalemiya-Kolfe-Aserasement-Mazoriya-Lekuwanda Street as under Pass

This option is done by keeping the Ring Road as it is (at Grade) and the Mesalemiya-Aserasement Mazoriya-Lekuwanda Street as underpass.

Merits

- The topography of the area from Mesalemiya to Kolfe is very suitable for this option so that we can get gentler slope for the underpass; and
- The Stretch of the Retaining wall section is less than option one which will make this option less costly.

Demerit

- On the Kolfe side additional ROW is required since the road width is only 30m as opposed to the width of Project road of 40m width and
- It does not give priority to the Ring Road traffic since it will be mixed with left turning vehicles and pedestrians.

Figure 33. Plan for option 2

5.3 Full Signalized Intersection

The Kolfe intersection is very busy with vehicular traffic mixed with pedestrian traffic. In such cases, where the pedestrian traffic is high, it is recommended to supplement roundabouts with signalization or change the intersection to a fully signalized control intersection. In signalized intersection option, the intersection time is optimally utilized as per the vehicular and pedestrian traffic demand. The vehicles and pedestrians will have their red and green time as per the demand of the respective traffic volume. Count down signalized controls is currently implemented at various busy intersections of Addis Ababa. Parking areas and loading and unloading areas for urban public transportation shall be managed by installing regulating and controlling traffic signs.

In this option, both the Ring Road and Mesalemiya-Kolfe-Aserasement-Mazoria-Lekuwanda will be kept at grade and the traffic flow will be controlled by traffic Signals of multiple phases.

Merits

- This option has less initial construction cost as there is no interchange to be constructed; and.
- Since there is no defined traffic and land development in the area this option provides freedom for any type of future modifications of the intersection.

Demerits

- This option is subjected to future modification as the solution is only temporary; and
- The traffic in need of higher speeds is equally treated with local traffic.

5.4 Traffic Management

In addition to the above improvement options, traffic management schemes are suggested to supplement the smooth traffic flow. The schemes can be implemented as per their applicability.

5.4.1 Time management and diversion of traffic

The Kolfe intersection traffic flow is adversely affected by high peak hour flows and moderate off peak hour flows. The heavy truck traffic in need of using the ring road will aggravate the traffic congestion during the peak hours. For this purpose, by-pass roads are suggested for peak-hour demands. Low occupancy vehicles with less than two occupants can also be restricted to use little early or little after the peak hours Therefore, high occupant urban public transportation vehicles are given priority during the peak hours. If low occupancy vehicles are diverted to adjacent by-pass roads during peak-hours additional crossing points of the ring road as underpass; with clearance heights not more than 3 m will be required at appropriate locations.

5.5 Non-motorized transportation

5.5.1 Pedestrian traffic management:

The Kolfe intersection is characterized by high demand volume of pedestrian traffic which severely affects the flow of vehicular traffic. The pedestrian traffic can be managed as follows:

- By provision of underpass or overpass pedestrian crossings adjacent to the intersection in addition to the existing ones;
- Improvement of the land use management which involves relocation of the business centers which can reduce the pedestrian traffic attractions; and
- Access control of the pedestrian traffic by provision of fences and directing the pedestrians to Zebra Crossings, pedestrian crossing underpasses or bridges is required. The fencing has to be not less than 1.5m to obstruct those who want to jump over.

5.5.2 Bicycle ways

- Bicycle ways provide dedicated lanes that are safe and comfortable for bicyclists. They are cheap to use, have health benefits because they help people to exercise and they require no major infrastructure.
- Bicycle ways shall be defined at the planning and design stage of streets. Bicycle routes shall be implemented in cities having comfortable topography. They have to be well marked and labeled.
- Bicycles do not use fuel, maintenance costs are very low, and space requirements are minimal and could be parked in small space. Therefore, bicycle ways need to provided and people have the interest to use it should be encouraged to do so.

5.5.3 Restriction of road side parking along the frontage street

To maximize the flow of right turning traffic and to utilize the frontage roads for right turning traffic, it is suggested to restrict the road side parking immediately after the intersection. With this perspective, off road parking lots have to be provided in order to access the businesses and amenities near the intersection. If necessary, additional right of way is required for street side parking.

5.5.4 Provision of rumble strips at steep slopes

The Kolfe Intersection is a frequent accident spot. As informed by the nearby traffic police office, severe accidents with high fatality rates at one incident had been encountered. This was caused by heavy vehicles coming from the Wingate side to the intersection with full speed. Therefore, installing transverse rumble strips at frequent intervals on the carriage way of the ring road from the Wingate side is required to alert drivers.

5.5.5 Underpasses and improvement of local street network

To divert the vehicles directed to the Kolfe intersection, local streets improvement and underpasses to the Mesalemiya-Kolfe Road are suggested to be provided. Improvement of the by-pass and local streets to asphalt or cobble stone standards with connection to the other side of the Ring Road through underpasses is highly recommendable.

5.5.6 Speed control

Speed control can be carried out by installing speed limit signs ahead of the intersection. It is suggested that all speeds at mixed traffic dominance to be under 50 kph.

Table 36: Policy on Geometric Design of Highways and Streets

Ranges for Lane Width	
Street Type	**Metric (meters)**
Principal Arterial Street	3.6
Ramps (1-lane)	3.6-9.2
Arterial	3.3-3.6

Collector	3.0-3.6
Local	2.7-3.6

Source: AASHTO, 2009

As activities in Addis Ababa and specific area are predominantly governed by informality and market forces, the role and extent of informality in shaping the spatial structure of the city needs a further study. There will be much to learn about in this aspect to guide the development of both the specific area additionally the city in a sustainable manner, and it could be an interesting topic to explore, as well.

5.6. Direction for Future Research

As activities in Addis Ababa and specific area are predominantly governed by informality and market forces, the role and extent of informality in shaping the spatial structure of the city needs a further study. There will be much to learn about in this aspect to guide the development of both the specific area additionally the city in a sustainable manner, and it could be an interesting topic to explore, as well.

ANNEXES

Annex 1. Respondents' Structure and Profile in the Study Area (Mesalemiya-Kolfe-Aserasement Mazoria-Lekuwanda Street)

Respondent characteristics

Regarding sex distribution in the study area, it is nearly balanced. It was indicated that there is stable settlement in the study area. The results of sample survey indicated that active age group comprises 82.8%. This implies that there is significant number of active labor force in the study area. Dependency ratio in the study area is 17.2%. This implies that 17.2 percent of the population is economically dependent on active population.

Household size

The average household size in the study area is 4.2. In some cases, it was found to be more than 12 family members living in a single house and was significantly higher than the national average which is 5.

Employment status of respondents

As shown in the preceding table, students, contribute the majority (28.3%) in the study area. On the other hand, respondents that are engaged in non-government organizations (NGOs) and Micro and Small Enterprises (MSEs) contribute the smallest share (0.5% each).

Educational status

Based on the sample survey conducted in the study area, the majority of the populations (92.7%) were found to be literate who can at least read and write in one or more languages. Table 35 below shows summary and percentage distribution of sampled household (HH) heads and HH members by different classifications, in the research area, 2016.

Summary and percentage distribution of sampled households

	HH heads		All HH members	
Occupation	**Number**	**%**		**Number**
Government Employee	4	15.4	Government Employee	24

Private Employee	5	19.2	Private Employee	49
Business	7	26.9	Business	93
Daily Laborer	3	11.5	Daily Laborer	48
Student			Student	26
Pensioner	2	7.7	Pensioner	12
Housewife	1	3.9	Housewife	6
Unemployed	2	7.7	Unemployed	10
Others	2	7.7	Others	6
Total	**26**	**100**		276

Respondents by sex, number and percentage shares

S. No	Sex	No. of Respondents	Percentage
1.	Male	124	47.83
2.	Female	144	52.17
Total		276	100

Source: PrimaryData-2016

Classification of respondent by Age and Number

S.No	Age	No. of Respondents	Percentage
1	Below25	44	15.94
2	26to30	72	26.08
3	31to35	82	29.71
4	Above36	78	28.26
Total		276	100

Source: Primary Data-2016

Classification of respondent by Educational Qualifications

S. No	Educational Qualification	No. of Respondents	Percentage
1	Illiterate	10	3.62
2	Primary	4	1.45
3	8^{th}grade to 10^{th}grade	38	13.76
4	10^{th}grade above	42	15.21
5	12^{th} Complete	98	35.5
6	Diploma	54	19.6
7	BA/B.Sc.	26	9.42
8	M.Sc.	4	1.45
9	PhD		
Total		276	100

Source: Primary Data, 2016

Religion of respondents

Majority of the respondents in the action area are followers of the Ethiopian Orthodox Christian Church (62.0%) followed by Muslims (29.7%), Catholics and Protestants (4.7%) and others (3.6%).

Distribution of respondents by religion

S.No	Religion	No. of Respondents	Percentage
1	Christians	171	62
2	Muslims	82	30
3	Pagan	10	3.3
4	Others	13	4.70
Total		276	100

Source: Primary Data-2016

Other Attributes

Experience on Driving

S. No	Period of Experience	No. of Respondents	Percentage
1	0to5Years	4	17.40
2	6to10Years	3	13.04
3	11to15Years	12	52.17
4	16to20Years	2	8.70
5.	Above21	2	8.70
Total		23	100.00

Source: Primary Data-2016

Distribution of Respondents 'on Working Days in a Month

S. No	Working Days	No. of Respondents	Percentage
1	30days	24	9.23
2	26days	110	42.31
3	22days	104	40.00
4	Others	22	8.46
Total		260	100

Source: Primary Data-2016

Distribution of Respondents' on Income Per day

S. No	Income (ETB)	No .of Respondents	Percentage
1	Below200	47	17.03
2	201-600	23	8.33
3	601-1200	58	21.01
4	Above 1201	148	53.62
Total		276	100.00

Source: Primary Data-2016

Distribution of Respondents' on Expenses Per day

S. No	Expenses (ETB)	No. of Respondents	Percentage
1	Below75	134	47.18
2	76-100	88	30.99
3	101-125	26	9.15
4	Above126	36	12.68
Total		276	100.00

Source: Primary Data-2016

Distribution of Respondents 'Loss Per day

S. No	Expenses (ETB)	No .of Respondents	Percentage
1	Below75	88	31.88
2	76-100	174	63.04
3	101-125	8	2.90
4	Above126	6	2.17
Total		276	100.00

Source: Primary Data-2016

Annex 2:- A. Travel Time table for seven days

The data is taken from September 19, 2016- September 25, 2016 (7 days data)
The data are expressed in minutes second and micro second:
Table 37Data of Travel Time Survey for Seven Days

Monday Sept19 2016 From 3:30 -7:30 AM				Thursday Sept 22 2016 From 3:30 -7:30 AM			
Mode of transportation Evening				Mode of transportation			
A.Bus	Shared Taxi	Higer	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
27:01:08	27:09:58	25:23:09	12:09:38	15:08:43	14:59:12	14:09:13	9:51:23
29:31:06	23:27:09	21:08:31	11:39:31	27:07:39	19:39:01	20:16:31	9:11:48
28:48:36	25:41:03	24:19:39	14:03:51	23:02:11	16:18:18	18:28:21	10:50:14
29:23:21	24:49:53	26:09:36	13:32:02	26:48:02	21:01:51	21:19:12	12:18:21
32:08:24	27:08:01	29:38:19	10:48:22	22:23:39	18:34:09	20:23:48	11:08:19
31:42:37	28:33:29	30:45:52	12:16:31	21:16:40	18:10:09	18:50:09	14:34:17
29:57:19	23:49:31	30:12:30	16:40:58	24:19:07	16:29:17	22:16:11	14:01:30
28:33:26	26:41:01	28:19:48	17:53:31	20:10:23	17:13:11	20:09:14	16:19:43
29:38:15	25:55:01	26:59:41	13:38:03	22:32:03	17:48:08	19:29:05	12:16:57
Monday Sept19 2016 From 3:30 -7:30 AM				Friday Sept 23 2016 From 7:30 -10:00 AM			
Mode of transportation Evening				Mode of transportation			
A.Bus	Shared Taxi	Higer	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
24:31:08	21:39:02	21:31:31	19:52	18:19:12	14:43:41	17:10:41	8:58:11
25:28:39	20:57:54	24:48:19	20:37	18:16:31	13:16:08	17:11:23	8:31:10
29:37:52	19:48:31	24:16:08	18:23	21:11:08	17:42:03	20:07:05	7:22:14
28:23:50	22:43:43	26:36:53	19:25	26:10:33	21:34:05	25:48:10	11:31:09
27:39:18	24:51:16	25:42:23	26:30:00	29:41:10	23:42:12	25:23:12	13:19:17
31:21:03	23:39:19	28:49:17	28:56:00	31:51:23	24:06:03	29:07:17	14:13:12
29:47:30	21:53:01	28:58:48	24:18:00	31:26:11	24:16:17	30:02:03	16:23:16
29:53:27	22:49:23	28:19:39	27:50:00	30:45:09	23:02:07	30:07:17	16:12:10
28:20:21	22:17:46	26:07:52	23:13:53	25:57:40	20:17:50	24:22:09	12:03:50
Tuesday Sept 20 2016 From 7:30 -10:00 AM				Friday Sept 23 2016 From 3:30 -7:30 AM			
Mode of transportation				Mode of transportation			
A.Bus	Shared Taxi	Higer bus	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
16:28:39	13:57:39	15:08:36	13:30:11	17:09:16	16:03:16	19:39:51	12:08:54
16:39:48	17:39:59	18:51:42	15:47:18	15:16:27	13:17:39	13:31:07	14:07:07

15:23:21	16:41:48	15:18:18	11:19:02	19:29:31	17:37:40	19:42:08	13:49:31
17:41:32	18:29:58	17:49:23	12:23:27	19:11:17	16:05:02	19:01:18	13:21:15
21:56:43	17:23:13	19:34:49	11:44:52	22:12:42	18:31:12	19:07:10	16:18:39
20:49:38	21:39:48	22:29:08	14:59:32	25:19:07	21:10:45	22:31:08	17:02:33
21:52:23	23:41:18	21:16:18	12:29:23	24:01:01	19:42:00	24:12:02	16:11:37
23:24:08	19:00	22:27:08	14:38:39	29:30:19	22:01:10	25:08:01	18:07:48
19:17:01	18:34:13	19:06:55	13:21:33	21:31:13	17:49:32	20:21:36	15:08:26
Tuesday Sept 20 2016 From 3:30 -7:30 AM				Saturday Sept 25 2016 From 7:30 -10:00 AM			
Mode of transportation				Mode of transportation			
A.Bus	Shared Taxi	Higer bus	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
22:54:39	19:32:08	21:11:48	16:18:09	17:37:06	11:44:02	17:16:52	12:21:31
21:40:31	21:48:36	22:46:13	17:40:43	22:01:32	14:31:12	16:39	11:29:17
22:32:47	18:29:19	19:33:01	19:42:37	25:16:11	19:07:08	20:55:05	14:41:00
24:21:23	24:44:41	23:19:12	20:47:12	30:51:12	25:30:00	24:39:18	17:09:27
21:28:18	25:51:23	24:39:18	18:17:15	26:24:17	21:33:07	27:31:07	19:21:50
23:49:53	23:33:58	26:28:00	21:02:26	26:11:01	24:28:31	22:27:09	18:32:43
26:23:24	21:31:07	28:38:00	14:29:46	30:21:02	25:40:53	25:17:04	19:13:31
25:53:13	24:00:00	24:39:29	15:23:31	24:19:17	21:21:21	22:09:21	16:19:59
23:38:01	22:26:24	23:54:23	17:57:42	1:22:42	20:29:32	22:06:55	16:08:40
Wednesday Sept 21 2016 From 7:30 -10:00 AM				Saturday Sept 25 2016 From 3:30 -7:30 AM			
Mode of transportation				Mode of transportation			
A.Bus	Shared Taxi	Higer bus	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
23:16	18:18:31	19:08:10	14:03:48	25:39:02	19:21:12	19:55:01	14:05:06
21:21:44	17:09:09	20:16:08	12:42:39	27:07:00	24:32:08	21:19:20	20:12:07
22:02:31	23:43:03	24:11:11	14:51:41	22:16:31	21:08:18	17:51:11	20:53:22
16:52:48	21:18:55	18:22:33	11:16:13	24:08:31	19:27:39	27:37:12	19:21:44
19:41:09	22:41:18	21:16:31	12:11:16	35:41:27	29:05:22	30:14:00	27:29:19
21:18:58	24:19:39	24:31:57	12:09:28	27:21:20	19:16:09	24:22:32	20:42:13
27:50:39	22:07:27	24:31:57	14:27:19	27:33:42	21:21:16	26:39:21	20:57:24
29:21:33	20:17:01	21:17:40	16:38:30	29:05:11	23:06:03	28:19:58	19:31:54
22:43:10	21:14:23	21:42:01	13:32:37	27:21:36	22:09:46	24:32:19	20:24:09
Wednesday Sept 21 2016 From 3:30 -7:30 AM				Sunday Sept 24 2016 From 7:30 -10:00 AM			
Mode of transportation				Mode of transportation			
A.Bus	Shared Taxi	Higer bus	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.
25:08:36	18:18:19	22:31:47	10:41:18	17:11:01	10:07:01	13:15:12	7:09:12
20:16:08	17:07:09	23:41:51	11:23:26	12:07:52	9:12:09	10:07:17	5:07:39
26:32:11	22:11:50	23:22:02	10:49:12	14:01:07	12:02:12	15:32:02	7:12:03
19:51:28	17:41	21:07:19	13:16:51	17:07:35	11:08:19	14:11:53	7:05:00
26:08:10	23:20:16	22:35:46	12:12:30	16:33:04	11:18:53	15:37:23	6:41:18
31:01:02	24:08:18	26:13:53	14:21:08	15:06:31	10:44:48	13:04:08	6:39:00
28:16:41	22:11:23	22:01:10	12:31:31	17:44:32	12:51:03	11:46:39	5:21:47
30:10:51	24:21:47	25:08:01	16:08:39	16:34:49	10:41:07	11:01:01	7:33:59
25:55:38	21:10:00	23:20:14	12:40:34	15:48:19	11:00:41	13:04:27	6:36:15
Thursday Sept 22 2016 From 7:30 -10:00 AM				Sunday Sept 24 2016 From 3:30 -7:30 AM			
Mode of transportation				Mode of transportation			
A.Bus	Shared Taxi	Higer bus	Private ve.	A.Bus	Shared Taxi	Higer bus	Private ve.

19:08:18	16:09:31	16:19:25	11:13:16	16:21:07	12:12:17	17:06:32	9:16:23
16:01:06	13:38:01	14:08:55	10:17:36	16:17:16	14:37:39	15:19:44	7:12:16
21:39:40	18:09:57	20:18:32	14:06:08	14:39:46	11:30:18	15:29:13	7:43:07
22:16:16	17:21:10	19:23:41	12:29:40	18:18:24	13:20:46	17:13:12	6:17:36
25:09:54	21:27:50	24:16:52	12:09:16	18:41:33	12:40:11	16:12:43	9:40:02
22:51:12	18:01:27	23:48:34	10:10:11	13:53:22	11:37:24	13:31:51	11:07:17
24:10:11	19:56:36	22:03:01	14:03:01	18:27:38	13:53:16	17:05:36	11:01:39
18:32:18	13:48:12	19:11:38	15:04:08	16:15:17	12:38:42	12:07:48	10:53:03
21:13:37	17:19:05	19:56:20	12:26:39	16:36:48	12:48:49	15:30:50	9:08:55

Annex 3: List of stakeholders involved in the Addis Ababa Master Plan revision process

1. Addis Ababa City Administration
2. Ministry of Works and Urban Development
3. Addis Ababa City Roads Authority
4. Addis Ababa City Water and Sewerage Authority
5. Ministry of Federal Affaires
6. Oromiya Regional Government
7. Ethiopian Power and Electric Corporation
8. Ethiopian Telecommunication Authority
9. Private Organizations
10. Addis Ababa Trade Chamber
11. Mercato Committee
12. Higher Education's and Universities
13. Woreda, and Kebele Administrations
14. National and International NGOs and CBOs
15. Professional Associations
16. Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ), German Federal Ministry for Economic Cooperation and Development (BMZ)
17. Institute for Housing and Urban development Studies (IHS), The Netherlands
18. The United Nations Human Settlements Programme (UNCHS), Habitat
19. Austria, Netherlands, Japan, American Embassies

20. Office of Revision of Addis Ababa Master Plan (ORAAMP)
21. National Urban Planning Institute (NUPI)

Annex 4:- Interview Questions

This checklist is a research instrument for the study on **"Land use Planning Strategies and their Impacts on urban public transportation Supply of Addis Ababa"**: The study is Addis Ketema and Kolfe Keranio sub-cities (Mesalemiya -Aserasement Mazoria-Lekuwanda area) of Addis Ababa; theory and practice". This interviewing will remain is strictly confidential and your feedback will be used as input for the development of the research work which is dedicated for academic purpose will only appear as totals combined with those of other respondents for academic purposes only.

Purpose of the interview:

- To understand the trends of policy and strategies making in transport and land use planning authorities.
- To determine the problems of the newly developed areas of the city related to transport.

Date and time of interview: _____

Background of the interviewee:

Name:	
Telephone:	
E-mail address:	
Name of organization you work for:	
Type of the organization:	

Your position in the organization:	
Location of the organization:	

Land use planning (for authorities involved in land use planning only):

The Policy and Strategy Environment

1. Is there a specific working group to study the environment for land use policy? Please, explain the process of formulation and composition of the team, if any.
2. Have inter-agency project teams been formed while formulating land use policies? Please explain the process of formulation and composition of the team.

Stakeholder participation

3. Which organizations are involved in planning and policy development for land use policy in the city and how much control do they have?

Planning and policy area	**National Government**	**Regional Government**	**Private Org.**
Land use planning policy			
Master plan of the city			
Leasing arrangements			
Property/Tenure right			
Building regulations			
Property taxes			
Policy environment study			
Information			
Others			

4. Which stakeholders or organizations are involved in land use planning and policy formulation?
5. How do you characterize the working relationship of your organization with the Addis Ababa transport authority?
6. Do you have scheduled meetings with the Addis Ababa transport authority?
7. How do you evaluate the level of involvement of the Addis Ababa transport authority in the policy decision process of your organization?
8. Does your organization give trainings on participation or collaborative approaches to policy making?

Elements of land use plan

9. What initiates the need for new land use policies?
10. What elements of development are given more emphasis while formulating land use policies?

11. What issues and conflicts do you face related to land use policy, planning and project development?

12. What are the most important objectives of your authority?

13. Does your organization's planning explicitly address the effect of land use patterns on transportation needs in the city?

Problems of Mesalemiya -Aserasement Mazoriya-Lekuwanda Street

14. What do you think are the problems of the area of the two sub cities understudy concerning infrastructure and other amenities?

15. Which of these problems are related to land use patterns of the city specifically (Mesalemiya – Aserasement Mazoria-Lekuwanda)? (Example: Traffic flow, accessibility/travel time to facilities and services, safety, urban public transportation supply, pedestrian and bicycle facilities, land use/growth and development patterns, economy and jobs, land use and its effects on transportation needs, etc)

16. What do you think is the best approach to solve this problem? How important is integrating Land use and urban public transportation supply making to solve the problems?

Personal opinions

17. What are some of your issues/concerns regarding the future of both Addis Ababa, specifically (Mesalemiya -Aserasement Mazoria-Lekuwanda)? (Example: Land use, urban public transportation supply, housing, environment, resources, economic Development, social issues, etc…)

18. Who do you think should be involved in solving/addressing these issues?

19. What do you think are the indicators of quality of life in the newly developed areas?

20. What is your overall opinion on public transportation supply of the city?

Urban Public transportation Supply policy :(for authorities involved in transportation planning and supply only):

The policy and strategy environment

1. Is there a specific working group to study the environment for transport policy? Please, explain the process of formulation and composition of the team, if any.

2. Have inter-agency project teams been formed while formulating transport policies? Please, explain the process of formulation and composition of the team, if any.

Stakeholder participation

3. Which organizations are involved in planning and policy development for the modes of transportation the city and how much control do they have?

Planning and policy area	National Government	Regional Government	Private Org.
Transport policy			
Roads			
Pedestrian infrastructure			
Buses			
Taxis			
Fares policy			
Parking policy			
Information			
Others			

4. Which stakeholders or organizations are involved in transport planning and policy formulation?

5. How do you characterize the working relationship of your organization with the Addis Ababa Land Development Agency (LDA) or Land Administration Authority (LAA)?

6. Do you have scheduled meetings with the Addis Ababa LDA or LAA?

7. How do you evaluate the level of involvement of authorities responsible for land use planning of the city in the policy decision process of your organization?

8. Doesyourorganizationgivetrainingsonparticipationorcollaborativeapproachestopolicymaking?

Elements of urban public Transportation supply policy

9. What initiates the need for new urban public transportation supply policies?

10. What elements of development are given more emphasis while formulating urban public transportation supply policies? How much impact does the land use development plans have on the transport policy?

11. What are the most important objectives of your authority?

12. Does your organization's planning explicitly address the effect of land use patterns on transportation needs in the city?

Problems of the (Mesalemiya -Aserasement Mazoria-Lekuwanda)

13. What do you think are the problems of the two sub-cities understudy concerning infrastructure and other amenities?

14. Which of these issues are related to land use patterns of the city specifically (Mesalemiya - Aserasement Mazoriya-Lekuwanda)? (Example: Traffic flow, accessibility/travel time to facilities and services, safety, public transportation, pedestrian and bicycle facilities, land use/growth and development patterns, economy and jobs, land use and its effects on transportation needs, etc)

15. What do you think is the best approach to solve this problem? How important is integrated policy making to solve the problems?

16. Are major changes in transport regulations likely to occur in the near or distant future?

17. Did you conduct studies on the travel demand of the city in the future? If yes, what elements did

you consider? And to what extent is the master plan office involved in these studies?

Personal opinions

18. What are some of your issues/concerns regarding the future of Addis Ababa? (Example: Land use, transportation, housing, environment, resources, economic Development, social Issues, etc…)
19. Do you think there is a need for improving the transport system of the city? Which specific areas of the city? Why?
20. What are the alternatives to improve the urban public transportation supply options? (Example: improvements to public transportation (bus/rail), improvements to pedestrian and bicycle facilities, roadway improvements)
21. How do you envision decisions being made regarding these issues?
22. What do you think are the indicators of quality of life in the newly developed areas?
23. What is your overall opinion on land use policy of the city?

Annex 5:-List of Informants

S.No	Qualification	Name of organization they work for:	Type of the organization:	Position in the organization:	Location of the organization:
1	MSc.	T.G. Consulting P.L.C.	NGO	Directing Manager	Addis Ababa
2	BSc.	Anbessa City Bus Enterprise	Governmental	Operation Sub-process owner	Addis Ababa
3	MSc.	Addis Ababa Transport Bearau	Governmental	Operation Core-process owner	Addis Ababa
4	BSc.	W.T. Consulting P.L.C.	NGO	Directing Manager	Addis Ababa
5	Diploma	Addis Ababa Police Commission	Governmental	Chief. Officer	Addis Ababa
6	BSc.	Addis Ababa Transport Bearau	Governmental	Officer	Kolfe Keranio
7	BSc.	Addis Ababa Transport Bearau	Governmental	Officer	Addis Ketema
8	BSc.	Kolfe Keranio Sub-city	Governmental	Urban planner officer	Addis Ababa
9	BSc.	Addis Ketema Sub-city	Governmental	Urban planner officer	Addis Ababa
10	BSc.	ORRAMP	Governmental	Urban planner officer	Addis Ababa
11	MSc.	AACRA	Governmental	Design office	Addis Ababa/Sar bet/
12	MBA.	MoUWD	Governmental	Urban Planning office	Addis Ababa/Goma Kuteba/
13	MBA	Central Statistical Agency	Governmental	Head of Public Data	Addis Ababa Head Office /Piassa/

Bibliography

(2005). In *IBIS Transport Consultants Limited* .

AACRA. (November,2004). AACRA Geometric Design Manual. In AACRA. Addis Ababa.

AACTA. (2014). *Addis Ababa City Transport Autohority.*

Administration, A. A. (2015). *Addis Ababa City Atlas,first edition.*

Administration, A. A. (2013). *Addis Ababa City Guideline for Structural Plan* .

Agency, C. I. (2007). *The World Fact Book.*

Agency, C. S. (May 2014). *Statistical Report of 2013 Employment Survey of Addis Ababa.*

Agency, C. S. (May 2014). *Statistical report on the 2013 employment survey of Addis Ababa.*

Agrawal, D. B. (2011). *Congestion and its impact*. Retrieved June 03, 2016, from http://www.pwc.com/us/en/en/cities-of opportunity.

Agrawal, D. J. (2013, August).

Akililu, T. (2013). *The role of transport sector in Ethiopian economy.*

Akililu, T. (2013). *The Role of transport sector in Ethiopian economy.*

Alebachew, S. (2003). *Decentralization for effective municipal governance and poverty reduction; the case of Ethiopia.*

Armstrong, G. (1995a). *Integrating policy.* Ottawa: IN CENTER I.D.R.(Ed.).

Armstrong, G. (1995b). *Integrating Policy:implementing organizational change.* Ottawa,International Development Research Centre.

Asfaw, M. (2000). *Urban Mobility:Challenges and Prospects.*

Association, E. T. (2006). *Addis Ababa.*

Association, E. T. (2006). *Ethiopian Triple Helix Association.*

Authority, A. A. (2012). *Facts about Addis Ababa city transport.*

Authority, F. T. (2015). *Federal Transport Authority* .

Authority, F. T. (2016). *Federal Transport Authority.*

Authority, F. T. (2016). Federal Transport Authority Annual Report. *Bulletin* .

Bank, W. (1996). *Sustainable Transport: Priorities for Policy Reform. Development inpractice.*

Barth, M. *Real –world CO2 impacts of traffic congestion College of engineering –*. center for environmental research and Technology University of California.

Basler, E. (1998). *Measuring the Sustainability of Transport:atransport and Envirnoment INteraction.* National Research Program 41,Vol.M3.

Behavior? (1996). *A Study of the Link between Non-Work Travel and Land UseCharacteristics.*

Bertaud, A. (2002). *Note on Transportation and Urban Spatial Structure. ABCDE conference.*

Bertaud, A. &. (2003). *The Spatial Distribution of Population in 48 World Cities: Implications for Economies in Transition.*

Bertaud, A. B. (1988). *Efficiency in Land Use and Infrastructure.*

Bertaud, A. (1997). *Measuring Constraints on Land Supply:The case of Hong Kong.*

Bertaud, A. (1997). *Metropolis :A Measure of the Spatial Organization of 7 Large Cities.*

Bertaud, A. (2004). *The spatial organization of cities: Deliberate outcome or unforeseen consequence?*

Bertaud, A. (2003). *The spatial organization of cities: Rigid planning, chaos or self-organization? Panama.*

Black, A. (1995). *Lad use and Transport Interaction.*

Blaikie, N. (2000). *Designing social research, Cambridge, Polity Press.*

Boarnet, M. G. (1996). *Can Land Use Policy Really Affect Travel.*

Bratzel, S. (1999). *Conditions of success in sustainable urban transport policy-Policy change in 'relatively successful' European cities.Transport reviews Vol19,.*

Bus, A. C. (2016). *Anbessa City Bus yearly bulletin.*

Buturo, J. (1994). NGOs, democracy and sustainable development and in Africa. . *Voices from Africa,5.*

Carplus. (2004). *Cars in Land use Planning.*

Carplus. (2004). *Cars in Land use Planning.*

Central Statistics Agency, A. A. (1994). Report on the 1998 Welfare Monitoring Survey. *Statistical Bulletin* , 224.

COST. (1996). *Transport and Land-use Policies : Resistance and Hopes for Coordination.* Barcelona, European Commission.

CSA. (2007). *Central Stattistics Agency Census.* Addis Ababa: Central Stattistics Agency.

CSA. (May,2014). *Statistical report on the 2013 employment survey of Addis Ababa.*

Deakin, E. (2001). Sustainable development and sustainable transportation: Strategies for Economic Prosperity, Environmental Quality, and Equity. *Institute of Urban & Regional Development Working Paper Series.*

Dissanayake, D. (2004). *Integrated Transport and Land Use Policies For Developing Countries: Relocation of Residences, Road Pricing And Transit Subsidy.*

Division for sustainable development Agenda 21. UNDESA.ECDPM & ICEI (2006) EU mechanisms that promote policy coherence for development– A scoping study. (2004). Maastricht, European Union.

ERA. (2002). *Ethiopian Roads Authority Manual.*

ERA. (2013). *Ethiopian Roads Authority Manual.*

Ethiopia, C. s. (2007). *National Statistics. Addis Ababa.*

Fet, A. M. (2001). *Environmental Performance of Transportation-A Comparative Study.*

Fukasaku, K. K.-D. (2005). *Policy Coherence Towards East Asia: Development Challenges for OECD Countries. OECD development centre. .*

Garretson, p. (2000). *A History of Addis Ababa from its Foundation in 1886 to 1910.*

Geerlings, H. &. (2003a). *Integrating Transport, Land-Use Planning and Environment.*

Geerlings, H. &. (2003b). The Integration of land use planning, transport and environment in European policy and research. . *Transport Policy, Vol.10* , 187-196.

Geerlings, H. V. (2005). Towards a more fundamental transport policy: An inventory of trends that influence the transport patterns in western Europe and their implication for policy making. *Journal of the Eastern Asia Society for Transportation studies,6* , 4050-4065.

H.P. Blijie, H. P. (2002). Interaction of transport and land use: A framework for an integrated urban model. Delft, European Regional Science Association. *ERSA conference papers* .

Hailemariam, A. (2001). *Overview Of Public Administration in Ethiopia. Tangier, Morocco, C.A.F.R.A.D. African Training and Research Centre in Administration for Development.*

Harris, J. M. (2000). Basic Principles of Sustainable Development. . *GLOBAL DEVELOPMENT AND ENVIRONMENT INSTITUTE WORKING PAPER* , 00-04.

Hayashi, Y. (2004). Integrated land use and transport planning and policy for sustainable cities and regions. *FOVUS Network for Mobility. Stuttgart* .

Hyodo, T. S. (2005). A Comparative Study on Urban Structures and Transportation. *Eastern Asia Society for Transportation Studies, Vol. 6.*

ICEI, E. a. (2006). *mechanisms that promote policy coherence for development.* European Union: Maastricht,European Union.

Inam, A. L. (2002). *Developer-Planner Interaction in Transportation and Land use Sustainability.*

Inc., B. (2007). *Public policy.*

Inc., P. B. (1998). *A Guidebook.*

Inc., P. B. (1998). *Land Use Impacts of Transport: A Guidebook.*

Inc., P. S. (2002). Land use and sustainability. *Michiganin Brief.*

Institute), I. (. (1995). Livestock Policy Analysis. *ILRI Training Manual 2. Nairobi.*

IPEA. (2005). Land Development, Urban Policy and Poverty Reduction. *Urban Research Symposium. Brasilia, Brazil, The World Bank.*

ITE. (2004). *Promoting Sustainable Transportation Through Site Design. Washington DC, Canadian Institute of Transportation engineers.*

Jacobs, G. D. (1981). *AComparisonofBusOperationsin Cities ofDeveloped and Developing Countries. IN LABORATORY, T. A. R. R. (Ed.) CrowthorneBerkshire.*

Jacobs, G. D. (1986). *Review of Public Transport Operations.INLABORATORY,T.A.R.R.(Ed.)CrowthorneBerkshireUnitedKingdom.*

Jamet, F. a. (1998).

Jenks, B. a., & 1999, W.

Knaap, G. &. (2004). The Transportation-Land Use Policy Connection. Access to.

Knaap, G. a. (2004). *the Transport -Land Use Policy Connection. Access to Destination: Rethinking the Transport Future of our Region.* U.S.A.: University of Minnesota.

L., B. (2003). *Land Degradation in Ethiopia:Its extent and impact.*

Laboratory, T. R. (2002). *Scoping study: Urban mobility in three cities. Sub- Saharan AfricaTransport Policy Program.*

Limited, I. T. (2005). *Study of urban public transport conditions in Addis Ababa, Ethiopia. Addis Ababa.*

Litman, T. (2005). *Land Use Impacts on Transport: How Land Use Factors Affect Travel: How land use Factors Affect Travel Behaviour.Victoria.*

M Ward, J. D. *INTEGRATING LAND USE AND TRANSPORT PLANNING.*

Manual, H. c. (2009). *Highway capacity Manual.*

Melese, M. (2005). *City Expansion, Squatter Settlements and Policy Implications in Addis Ababa:The Case of Kolfe Keranio Sub-City.* Addis Ababa.

Meyer, M. a. (1984). *Urban Transport Planning: A Decision-Oriented Approach.* McGraw-Hill.

Meyer, M. E. (1984). Urban Transportation Planning: A Decision-Oriented.

MUDC. (2014). *Urban Plan Preparation and Implementation Strategy.*

Murayama, A. H. (2006). Toward Comparative Study on Spatial Planning Issues and Approaches inDiverse Megacities -Tokyo andMegacities around the World. *2006 World Planning School Congress.* , MexicoCity.

Mutume, G. (2004). Rough road to Sustainable development. . *Africa Renewal* , 18, 19.

Mutume, G. (2004). RoughroadtoSustainabledevelopment. *AfricaRenewal* , 18,19.

NCTCOG. (2007). *Sustainable Development.Texas, North Central Texas Council of Government.*

Newman, P. a. (2007). Greening Urban Transport. State of the World 2007: . *Our Urban Future* , 66-89.

Nolon,J.R.ComparativeLandUseLaw:PatternsofSustainability. (n.d.). *PACEENVIRONMENTAL LAW REVIEW,V.23* , 855-904.

OECD. (1997). *Improving Coherence: Challenges for.* Organization European Development Cooperation .

OECD. (1997). *Improving Coherence: Challenges for European Development Cooperation EuropeanCentreforDevelopment Policy Management.*

OECD, 2. c. (2014). *Centre for Development Policy Management, 2014 cited in IDRE.*

O'Leary, Z. (2004). The essential guide to doing research, London,SAGEPublication. *The essential guide to doing research* .

ORAAMP. (2015). *Addis Ababa,Addis Ababa City Government Office for the Revision of Addis Ababa Master Plan.*

ORAAMP. (2009). *Land Use and City Structure Studies Of Addis Ababa and the Metropolitan Area. AddisAbaba.* Addis Ababa City Government.

ORAAMP. (2012). *Report on Structural Plan of Addis Ababa,Expansion Trends.Addis Ababa.*

Pattenden, M. G. (n.d.). International Council of Local Envirnomental Initiatives.

Peters, B. G. (2005). *Search for Coordination and Coherence in Public Policy: Return to the Centre.*

Peters, B. (1998). *Managing horizontal government:The politics of co-ordination.Public return to the centre?*

Plan, A. A. (2014). *Addis Ababa City Transport Plan.*

Planning, A. G. (2003). *Integrated Transport Planning Framework.* Queensland Government.

Program, U. N. (2014). *UNDP.*

Pujinda, P. (2006). *Planning of land-use developments and transport systems in airport regions. Darmstadt, Technical* . University of Darmstadt.

Pujinda, P. (2006). *Planning of land use developments and transport systems in airport regions.Darmstadt,Technical University of Darmstadt.*

Representatives, F. d. (2004). *A.A.C.G. Executive and Municipal Organs Establishment Proclamation No. 2/2003 re- amendment Proclamation. The Federal Negari Gazeta.*

Representatives, F. d. (2003). *A.A.C.G. Revised Charter Proclamation. Federal Negari Gazeta.*

Rodríguez, D. A. (2004). *The Connection between Land Use and TransportationinLandUsePlans.* North Carolina Department of Transportation (NCDOT).

S., S. (2015, June 22). Retrieved 2016, from http://keydifferences.com/difference-between-strategy-and-policy.html#ixzz4dtzltLNe: http://keydifferences.com/difference-between-strategy-and-policy.html#ixzz4dtzltLNe

Schipper, L. (2002). Making Urban Transit Systems Sustainable Around the World: Many Birds with One Bus?. *Transportation Research Record* , 1791.

Schwaab, J. (2001). Economic Instruments for Sustainable Road Transport: An Overview for Policy Makers in Developing Countries. *Transport and Mobility* .

Smolka, M. (2006). Property Taxation and Informality: Challenges for Latin America. *Land Lines,Vol,28* .

Stead, D. (2003). *Institutional arrangements: experiences and lessons from Denmark, England and Germany.* . Nicosia: Sustainable and Healthy Urban Transport and Planning. .

Stead, D. (2003). Institutional arrangements:experiences and lessons from Denmark,England and Germany. *Sustainable and Healthy Urban Transport and Planning.Nicosia.*

Stead, D. M. (2004). Policy integrationin practice:some experiences of integrating transport land-use planning and environmental policies in local government. *Human Dimension of Global Environmental Change: Greening of Policies-Interlinkages and Policy Integration. Berlin.*

Stead, D. (2004). Policy integration in practice: ,Delft,DUP Science. *The integration of land use planning, transport and environmental policy-making in Denmark, England and Germany* .

Studies, C. f. (1999). *Centre for Urban Transportation Studies (1999) Land Use and Economic Development in StatewideTransportation Planning.Wisconsin,Federal Higway Adminstration.*

Taddesse, W. (September 2011). Assessing and quantifying the level of traffic Congestion at major intersections in Addis Ababa (a case for east-west corridor).

Transport, A. A. (2014). *Addis Ababa Road and Transport Survey.*

Ugland, T. &. (2006). Policy integration and international representation: Promoting food safety interests on the world stage. . *Canadian Political Science Association Annual Conference.York University,Canada* .

UNCHS. (2000). *An Overview of Urban Poverty in AddisAbaba. AddisAbaba.*

UNDP. (2014). *United Nations Development Program.*

UN-HABITAT. (2007). *Situation Analysis of Informal Settlements In AddisAbaba;Addis Ababa.*

Wee, B. i. (1997). National Institute of Public Health and the Environment.

Wee, B. u. (2000).

Wegener, M. F. (1999). *Land Use Transport Interaction: State of the Art.*

Wright, L. M. (2004). *Reclaiming public space:The economic,environmental, and social impacts of Bogotá's transformation.Citiesfor People Conference.Copenhagen, Denmark.*

Zegras, P. (2004). The Influence of Land Use onTravel Behaviour:Empirical Evidence from SantiagodeChile. *Journal of theTransportation Research Board.*